

polytechnic education in ontario



Ministry of
Colleges and
Universities

Ontario

Hon. Bette Stephenson, M.D., Minister
Dr. H.K. Fisher, Deputy Minister

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-80P52





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Summary

September 1980

Three specific program areas are studied because of their current importance to industrial needs: engineering and engineering technology, business and related studies, and computer-related studies.

In engineering, Ontario's program coverage is generally broad, and does not appear to have gaps when compared with the British system. It could, however, be argued that closer coordination/consultation in program planning between the colleges, universities and Ryerson is desirable, given the considerable overlap between the engineering and engineering technology fields.

Similarly, data are presented to show that in business and related studies, Ontario's post-secondary systems, between them, provide as much breadth of coverage as do polytechnics in England and Wales. There is considerable overlap between colleges, universities and Ryerson, raising the question of possible duplication.

The field of computer studies involves many disciplines functioning at many levels. While programs in Ontario are rigidly stratified into "college" and "university" levels with a small intermediate level at Ryerson, industrial needs suggest a continuum of skills is required, again raising the question of a need for improved coordination. In general, the breadth of programs in this area is "polytechnic."

Manpower Supply and Demand

Areas of manpower shortage were identified using Statistics Canada labour force and graduate employment surveys, Canada Employment and Immigration Commission data, an Ontario Manpower Commission survey, and the Economic Council of Canada's 1980 Human Resources survey. Data from all sources

suggested there was no general shortage of post-secondary graduates vis à vis current requirements, but identified some specific areas of over-supply and shortage from both CAATS and universities. Most current shortages are in trades and skilled worker categories. Of the professional and semi-professional occupations for which university, Ryerson and CAAT post-secondary programs prepare people, only engineering, accounting and business- and computer-related fields are experiencing shortages. All three types of institution in Ontario offer these programs, suggesting that the potential for meeting needs now exists. If there is a problem, it may be a function of capacity limitations rather than programming gaps.

Education Programs and the Professions

In Ontario, paraprofessional programs leading to certification tend to be found in CAATs, and professional programs leading to licensure, in universities. The considerable substitution in function and tasks between paraprofessionals and professionals again argues for more coordination in program planning between colleges and universities.

Research and Development

An increase in research and development in Ontario would likely place a greater burden on the universities rather than on Ryerson or the CAATS, since the universities' mission embraces research and graduate education, and since most industrial research is carried out by people with higher degrees. Broadening the mandates of the CAATs and Ryerson to include research should not be contemplated without a careful study of staffing and resource implications, and only if

there is "a clear indication of a definite and massive increase" in research and development activity in Canada.

The Issues

While supply and demand of post-secondary graduates are in rough overall equilibrium at present, any significant economic shift could alter this balance. Questions are raised in the paper about possible needs for better coordination in program planning, for "bridging" mechanisms between professional and paraprofessional streams, and about the effects of these on institutional roles and provincial resources.

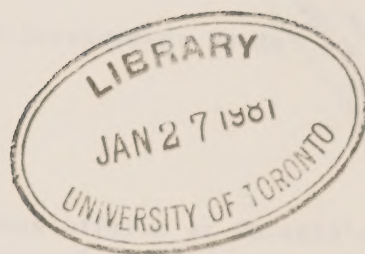
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1.0 INTRODUCTION

In recent years, it has been suggested that polytechnic education in Ontario should be expanded. At the present time, Ontario has only one institution formally called a polytechnic. Several arguments have been advanced publicly. These include the following: Students are not trained to meet client needs and are not as competent as those produced in other countries. There are shortages of skilled tradesmen, middle management and other skilled manpower to meet industrial needs. There is a need for programming that is more than vocational; the vocational needs to be mixed with the more sophisticated skills and perceptions.

The Ontario economy is highly industrialized. Supporting it is a large system of post-secondary education including 15 universities, 22 colleges of applied arts and technology, as well as Ryerson Polytechnical Institute and the Ontario College of Art. The system has developed rapidly since World War II. Does the system meet current and prospective needs? Does it need adjustment to respond to rapid social, economic and technological change?

In addressing these questions, the Ministry of Colleges and Universities first supported a study of polytechnic education in England and Wales in comparison with polytechnic education in Ontario. Secondly, the Ministry conducted its own review of post-secondary education in Ontario. This review has lead to the preparation of this paper. In this paper, the issues are discussed.

This paper does not represent government policy. It is intended simply to assist public discussion of the issues. The paper will be forwarded to the colleges of applied arts and technology, the universities and Ryerson Polytechnical Institute, as well as other interested groups for study and comment.

2.0 THE NATURE OF POLYTECHNIC EDUCATION

What is "polytechnic" education? There does not appear to be a standard definition of the term polytechnic education.

Etymologically, the word means "the many arts" or "the many skills". It denotes a wide, albeit not necessarily universal coverage of disciplines, or subject fields. The word could, and often is, applied to many different kinds of institutions.

The term "polytechnic" is sometimes loosely associated with institutes of technology. Institutes of technology, however, are sometimes dedicated solely to industrial technologies. In other circumstances, institutes of technology are more polytechnic in their orientation because their program coverage is very broad and extends well beyond industrial technologies. Institutes of technology also operate at many levels. Some, like the Massachusetts Institute of Technology, conduct basic scientific research and education at the highest level; others may operate primarily at the diploma and sub-diploma levels, without involvement in basic or applied research.

France has only one institution formally entitled a polytechnic, the prestigious Ecole Polytechnique, which is generally considered to be on the same level as the Massachusetts Institute of Technology. It is primarily devoted to engineering. France has a system of university institutes of technology which are considered to be at the university level. Italy has only two state polytechnics which comprise faculties of engineering and architecture. They do not differ much from universities.

The term polytechnic was applied to technical, engineering, architectural and naval colleges established in Germany in the middle of the 18th Century to make "new discoveries in nature and invent useful machines and methods." These institutions evolved into technical universities and are regarded as essentially

universities including research and graduate studies.¹

Switzerland has two polytechnics whose scope covers science and mathematics, engineering and architecture.

In the United States, the term polytechnic is not generally used in its numerous and highly variable systems of higher education. Yet, junior colleges have developed which are polytechnic in the sense that their programs are wide-ranging in scope and usually incorporate applied and theoretical studies. These institutions often offer an intermediate level degree, the associate in arts, which is usually awarded two years after high school graduation for purposes of transfer to four-year degree programs. The Japanese appear to have followed the U.S. model to a considerable extent.

The English system of polytechnic education is sometimes studied as a kind of prototype. The English system was described in the recently released report, A Comparison of Polytechnic Education in England and Wales with Polytechnic Education in Ontario by A. Wilkinson.² Some of the more important features of the English polytechnic system may be outlined:

1. It has both degree and diploma level programming.
2. It has some post-graduate level programming.
3. The polytechnics may engage in research; however, as of 1977, the level of research activity was small - less than 5% of all polytechnic expenditures.³
4. It fits the etymological meaning of the word "polytechnic" in that the coverage of subjects is wide ranging. Table 1 lists the areas of study offered in 1978 and it can be

¹J. Fischer in Problems of Integrated Higher Education: An International Case Study of The Gesamthochschule (Paris: International Association of Universities, 1972).

²A. Wilkinson, A Comparison of Polytechnic Education in England and Wales with Polytechnic Education in Ontario, (Toronto: Ministry of Colleges and Universities, February, 1980).

³"British Polytechnics-- Looking for a Place in the Sun", European Scientific Notes, ESN 32-6, June 30, 1980.

seen that the programs vary from highly theoretical studies in the humanities, social and natural sciences and mathematics to more applied studies - arts and design, material and manufacturing, technology, engineering, business, social and related professional studies.

5. There is an emphasis on applied and career-oriented programs.
6. There is an emphasis on part-time and "sandwich"-type offerings permitting more on-the-job exposure during training.

The English polytechnic system combines many of the characteristics of the Ontario college and university systems in one institution.

However, two points should be noted. First, the offerings do not embrace the non-post-secondary level offerings of the Ontario colleges in the trades and skilled work categories. This is a very important component of the Ontario college system. It means that the English polytechnics do not deal with the very occupations where, as we shall see below, many skilled manpower shortages occur.

Secondly, the preponderance of programming effort in the English system is at the degree level. In fact, the ratio is about 3.7 degree programs to 1 diploma program. The English polytechnics are now seen to be overlapping the work of the universities. In a 1977 report to the British Science Research Council, it was noted that "...there is little that the polytechnics do at undergraduate and graduate levels that the universities would not also do."¹

Each industrialized country has responded to the need for higher education in its own way. Internationally, there is no consistent use of the term polytechnic. It has different applications in many settings. For analytical purposes, however, this paper will use the word in its basic meaning which denotes a broad, more or less comprehensive coverage of fields of study with the added dimension that this meaning combines theory and applications.

¹Ibid.

Many comparisons will be made with the English polytechnic system simply because it appears to be the most highly developed system bearing the name polytechnic. In many respects, it would be more appropriate to make comparisons with German, American or even Japanese systems since their economies are currently more successful.

Programs offered in the French language are indicated in Appendix B. The issues raised in this paper apply to both language groups and thus the discussion is applicable to all programs regardless of language.

The focus of the paper will be Ontario. The major question addressed in this paper is whether the Ontario post-secondary system is sufficiently "polytechnic" in scope to enable it to respond to Ontario's manpower and other needs. The Ontario system's post-secondary program offerings, the province's skilled manpower needs, and its research and development needs as well as relations between the professions and educational programs will be reviewed. Many questions can be raised. For example, what types of changes will increased technological development bring to the post-secondary education system and manpower needs? What will be the implications of the increasing use of robots in production? In conclusion, several questions will be posed in an effort to foster discussion regarding implications of the issues and questions presented in this paper.

Table 1

ENGLAND AND WALES
THE POLYTECHNICS
1978 - FULL-TIME AND SANDWICH COURSES

<u>PROGRAM</u>	<u>NO. OF POLYTECHNICS OFFERING DEGREES</u>	<u>NO. OF POLYTECHNICS OFFERING DIPLOMAS</u>
<u>ART AND DESIGN</u>		
Fine Art	19	
Graphic Design	14	
3-D Design	14	
Ceramics	5	
Furniture	7	
Industrial Design (Engineering)	7	
Industrial Design (Transportation)	1	
Interior Design	9	
Jewellery	3	
Silver Metal	1	
Silversmithing	3	
Theatre	2	
Wood/Metal/Ceramics	1	
Wood/Metal/Plastics	3	
Textiles/Fashion	12	
Administrative/Business Studies	1	
Coutour - Fashion	1	
Embroidery	2	
Fashion	10	
Footwear Design	1	
Knitwear Design	1	
Textile Design	2	
Woven and Printed Textiles	5	
Inter-Area Graphic and 3-D Design	1	
	<hr/> 125	<hr/> Nil

SCIENCE AND APPLIED SCIENCE

Astronomy	3	-
Biochemistry: Biochem. Engineering	9	1
Biology/Biological Sciences	22	10
Biomolecular Science	2	-
Chemistry	27	13
Computer Science/Studies	23	22
Cosmetic Science/Technology	1	1
Environmental Science/Ecology	13	-
Fishery Science	1	-
Food and Dietetics	4	1
General Science	8	-
Geology/Geophysics	11	-
Information Systems	2	-
Maritime/Nautical Studies	3	1
Materials/Polymer Science	9	1
Mathematics	20	-
Mathematics, Statistics and Computing	14	14
Medical Technology and Science	2	2
Occupational Hygiene	1	-

<u>PROGRAM</u>	<u>NO. OF POLYTECHNICS OFFERING DEGREES</u>	<u>NO. OF POLYTECHNICS OFFERING DIPLOMAS</u>
<u>SCIENCE AND APPLIED SCIENCE</u>		
Pharmacology	4	-
Pharmacy	5	-
Photographic Sciences	1	-
Physics/Physical Electronics	18	7
Physical Sciences	10	-
Physiology	7	1
Statistics	13	-
	<hr/> 233	<hr/> 74
<u>MATERIAL AND MANUFACTURING TECHNOLOGY</u>		
Ceramic Technology	1	-
Food Technology	1	3
Fuel Technology	3	1
Metallurgy	4	4
Polymer/Materials	8	3
Printing	-	1
Textiles	2	2
	<hr/> 19	<hr/> 14
<u>ENGINEERING</u>		
Aeronautical	3	2
Chemical	5	4
Civil/Structural	18	15
Communication	3	-
Computer Technology	2	-
Control and Instrumentation	7	5
Electrical	22	23
Electronic	22	23
Engineering Science	2	-
Environmental	3	-
Illumination/Vehicle	2	-
Mechanical	26	26
Mining	1	3
Naval Architecture	2	1
Production/Industrial	15	15
	<hr/> 133	<hr/> 117
<u>ENVIRONMENTAL STUDIES</u>		
Architecture	16	-
Building/Construction	10	13
Environmental Studies	8	-
Estate Management	14	3

<u>PROGRAM</u>	<u>NO. OF POLYTECHNICS OFFERING DEGREES</u>	<u>NO. OF POLYTECHNICS OFFERING DIPLOMAS</u>
<u>ENVIRONMENTAL STUDIES</u>		
Geography	21	-
Landscape Architecture	3	-
Planning/Housing Studies	11	-
Surveying: Quantity	12	2
Surveying: Building/Land	7	3
	<hr/> 102	<hr/> 21
<u>ARTS AND HUMANITIES</u>		
Arabic, Chinese, Italian	2	-
Classics/Classical Civilization	1	-
English/Literary Studies	20	-
French Studies	21	1
German Studies	20	1
History/Historical Studies	25	-
History of Art and Design	9	-
Humanities/Modern Studies	20	-
Linguistics	1	-
Modern European Studies	9	-
Music	8	-
Performance/Movement Studies	6	-
Philosophy and Religious Studies	9	-
Photographic Arts: Art & Design	2	-
Russian Studies	6	-
Spanish/Latin American Studies	12	-
	<hr/> 171	<hr/> 2
<u>BUSINESS, SOCIAL AND RELATED PROFESSIONAL STUDIES</u>		
Accountancy/Finance	25	2
Business Studies	29	30
Communications/Media Studies	5	-
Education/Certificate Education	22	12
Hotel, Catering & Institutional Management	4	9
Economics	25	1
International Relations	2	-
Law	22	1
Librarianship/Information Studies	7	-
Marketing	15	5
Nursing - Speech Therapy	5	-
Operational Research	5	-
Personnel Administration	3	-
Politics	21	-
Psychology	13	-
Public/Social Administration	14	5
Social Studies/Science	22	-
Sociology	22	-
Transport	2	1
	<hr/> 263	<hr/> 66

<u>PROGRAM</u>	<u>NO. OF POLYTECHNICS OFFERING DEGREES</u>	<u>NO. OF POLYTECHNICS OFFERING DIPLOMAS</u>
<u>INTERDISCIPLINARY</u>		
Combined Studies	10	-
Computing & Business Studies/ Economics	5	-
Education & Science/Business Studies	3	-
Engineering & Business/Other Studies	4	-
Geography and History/Economics	8	-
Industrial Studies	1	-
Languages, Economics & Politics	9	2
Librarianship With Modern Languages	1	-
Science and Business/Other Studies	11	-
Social and Physical Sciences	5	-
Society & Technology	2	-
Sports Science	1	-
Modular Degree: Diploma H.E.	14	11
	74	13
<u>GRAND TOTAL</u>	<u>1,120</u>	<u>307</u>

SOURCE: A. Wilkinson, A Comparison of Polytechnic Education in England and Wales with Polytechnical Education in Ontario, (Toronto: Ministry of Colleges and Universities, February, 1980).

3.0 PROGRAM OFFERINGS IN UNIVERSITIES AND COLLEGES OF APPLIED ARTS AND TECHNOLOGY OF ONTARIO

As we have seen, the root meaning of the word "polytechnic" implies breadth of program coverage. The coverage of the polytechnic is comprehensive and encompasses both the theoretical and the practical or applied disciplines.

Is the programming of the post-secondary system of Ontario "polytechnic"? Do students in Ontario have access to a broad range of subjects both practical and theoretical? Is appropriate emphasis given to "applied" studies? It is difficult and in many respects unsatisfactory, to compare programming across educational jurisdictions. However, because the polytechnics of England and Wales have recently been studied as prototypes of polytechnic education,¹ some comparison has been attempted.

Appendix A lists all the fields of study covered by the polytechnics of England and Wales in 1978. It also shows whether the universities and colleges of applied arts and technology of Ontario offered programs in the same fields of study. It is impossible to determine how similar the programs may be; such an undertaking is beyond the scope of this study.

The data indicate that with a very few exceptions, Ontario institutions offer degree and diploma programs in the fields of study covered by the polytechnics of England and Wales. What is also evident is that, with a few exceptions, Ontario universities offer degrees in the same fields as the polytechnics of England and Wales. As noted earlier, the British polytechnics have placed heavy emphasis on degree programs and, in effect, have drifted into the traditional university sphere.

The Ontario college offerings of course, go beyond what is indicated in Appendix A. They embrace offerings in the trades and skilled worker occupations which the polytechnics of England and Wales do not. On the

¹A. Wilkinson, op. cit.

other hand, the Ontario colleges do not offer specialist or honours programs in the basic sciences or the arts and humanities.¹ This should not really be regarded as a deficiency since (1) the English polytechnics offer a few diploma programs in these fields, (2) the universities of Ontario already provide extensive offerings in these fields and (3) many colleges provide service courses in these fields. In general, therefore, the program coverage of Ontario post-secondary institutions is "polytechnic" in breadth as compared with the polytechnic model of England and Wales.

While the program offerings are broad in scope, what is the commitment of Ontario post-secondary institutions to career-oriented programs? In Table 2, we have attempted to assess the career orientation of the Ontario post-secondary system by dividing programs between professional and career-oriented on the one hand and arts and science on the other hand. We have then shown how full-time enrolments in 1977-78 in universities and colleges of applied arts and technology were distributed between these three categories. It is clear that the Ontario system is preponderantly dedicated to professional and career-oriented programs. In the system as a whole, more than 60% of enrolments are in professional or career-oriented categories. Even in the university system, there is a heavy commitment to professional and career-oriented studies.²

While the Ontario college and university systems together appear to be "polytechnic" in scope and committed to career-oriented programs, three fields of study have been chosen for a closer examination viz., engineering and engineering technology, business and related studies, and computer-related studies. They have been chosen on the grounds of their current importance to industrial needs. The question will be addressed as to whether by layering post-secondary education into a "college" stratum and a "university" stratum, we are depriving students of opportunities to combine theoretical and practical studies.

¹Some General Arts and Science Programs are offered.

²It should be noted that a significant proportion of both career-oriented and professional programs relate to service occupations rather than occupations in primary or secondary industries. However, this is entirely in keeping with the direction development of the labour force has taken since World War II.

ONTARIO
FULL-TIME ENROLMENT IN ARTS & SCIENCE, PROFESSIONAL
AND CAREER-ORIENTED PROGRAMS IN POST-SECONDARY INSTITUTIONS
1977-78

Level	Arts & Science Programs	%	Professional Programs	%	Career-Oriented Programs	%	Other	Total
University Doctoral*	3,639	54.0	2,245	33.3	815	12.1	40	6,739
University Masters	4,512	44.7	1,876	18.6	3,398	33.6	312	10,098
University Undergraduate	73,526	56.6	30,674	23.6	25,198	19.4	393	129,791
CAAT Post-Secondary	1,078	1.8	-	-	58,282	98.2	-	59,360
CAAT Non-Post-Secondary	-	-	-	-	20,417	100.0	-	20,417
	82,755	36.6	34,795	15.4	108,110	47.8	745	226,405

Sources: Doctoral, Master's - Statistics Canada Data Summary; Undergraduate - Statistics Canada Catalogue 81204;
Colleges - Ontario College Information System.

* Doctoral includes part-time enrolment.

3.1 PROGRAMS IN ENGINEERING AND ENGINEERING TECHNOLOGY

The programs offered in engineering and engineering technology fields by Ontario universities, colleges of applied arts and technology and Ryerson are listed in Figure 1 (only undergraduate university programs are shown). Figure 1 also shows the degree and diploma programs offered in these fields by the polytechnics of England and Wales in 1978.

The offerings of Ontario institutions clearly do not take second place to the polytechnics of England and Wales in breadth of scope, particularly when we remember that Ontario's population is a small fraction of that of England and Wales. In chemical engineering technology, for example, Ontario has 14 programs in the colleges of applied arts and technology in addition to programs at Ryerson and Lakehead University. In 1978, the polytechnics of England and Wales offered only four higher national diploma programs in that field.

In the major branches of engineering, viz., chemical, civil, industrial, electrical and mechanical, Ontario institutions offer:

- (1) four-year degree programs leading to professional licensure (as well as studies at the Masters' and Doctoral levels);
- (2) three-year diploma programs leading to diplomas in engineering technology (as well as two-year technician programs in many instances);
- (3) the opportunity at Ryerson Polytechnical Institute and Lakehead University to upgrade a diploma in engineering technology to a degree in engineering or engineering technology.

The three-year Ontario college diplomas offer certification as engineering technologists and exemption from some of the examinations required by the Canadian Accreditation Board of the Canadian Council of Professional Engineers for persons without university degrees who want to qualify for the P.Eng. There is, therefore, bridging to professional licensure for college graduates. The bridging is more accelerated for graduates of the Ryerson bachelor of technology programs, who are required to take a maximum of 12 out of a possible 25 examinations.¹

¹Ontario Ministry of the Attorney General, The Report of the Professional Organizations Committee, April, 1980, p. 92.

The English polytechnics offer similar programs. Their degree graduates are exempted from both Part I and Part II of the Council of Engineering Institution's examinations. The English polytechnic degree therefore gives one the academic requirements for election to membership in the profession. The Higher National Diploma programs give exemption from Part I of the C.E.I. examination and are similar to the Ontario college diploma programs in this regard. Some English polytechnics also offer a two-year program to help persons without degrees in engineering to prepare for the C.E.I. Part II examinations.

Thus the English and Ontario systems are similar in broad outline except that degree graduates of Ryerson's engineering programs are not given exemption from all of the C.A.B. examinations. In Ontario, the professions are self-governing, so that any determination to extend the exemption privilege enjoyed by the universities would have to be a decision of the profession itself and not of government. The professions would doubtlessly be influenced by consideration of professional standards, supply and demand, and the public interest, in weighing the possibility of extending such exemption privileges.

Ontario's program coverage in engineering and engineering technology is, therefore, broad in scope and does not appear to have gaps in coverage at least in comparison with the English system. A middle or bridging stratum already exists at Ryerson and Lakehead. Is there a need for an expanded "middle stratum" of post-secondary between the college and the university strata? A 1975 study, The Engineering Technologist¹ reported considerable satisfaction with the type of generalized and specialized technical preparation technologists received in their educational programs. However, the report also identified a need to broaden the preparation into non-technical areas such as management and industrial/labour relations topics. The report specifically suggested development of some of the college programs into technology programs of four years duration leading to bachelor of technology degrees.

¹Goodings, Sidlofsky, Goodings & Associates, The Engineering Technologist, (Streetsville, Ontario: April, 1975).

In a subsequent section, we discuss improved bridging mechanisms in the professions. In view of both these needs, i.e. the need for more non-technical content in programs and the need for effective bridging mechanisms between the professions and related paraprofessions, there may be grounds for considering the expansion of some of the three-year programs in technology to four-year programs. Such an extension would give more flexibility to the post-secondary system as a whole and might well enhance its ability to respond promptly to shortages that develop from time to time in keeping with business cycles.

Since there is considerable overlap between engineering and engineering technology, it could also be argued that closer coordination or consultation in program planning between the universities, the colleges and Ryerson might be desirable.

ENGINEERING AND ENGINEERING TECHNOLOGY PROGRAMS
IN ONTARIO UNIVERSITIES, COLLEGES OF APPLIED ARTS & TECHNOLOGY
AND THE POLYTECHNICS OF ENGLAND & WALES

ONTARIO UNIVERSITIES	No. of Bac. Pgms.	ONTARIO CAATS	No. of Pgms.	LAKEHEAD & RYERSON	POLYTECHNICS OF ENGLAND & WALES	No. of Programs Degree H.N.D.
Aerospace Engineering	1	Air Conditioning & Refrigeration Engineering Ty.	1		Aeronautical Engineering	3 2
Biochemical Engineering	1					
Biological Engineering	1	Aviation (Transportation & Industrial) Engineering Ty.	1			
Biomedical Engineering	2					
Ceramic Engineering	1					
Chemical Engineering	9	Chemical Engineering Ty. Chemical (Environmental) Eng. Ty. Chemical (Industrial Hygiene) Engineering Ty. Chemical (Industrial) Eng. Ty. Chemical (Polymer) Eng. Ty.	14 1 1 1 2 1	Chemical Engineering Ty. (LA + RY)	Chemical Engineering	5 4
Civil Engineering	10	Civil Engineering Ty. Civil (Marine) Engineering Ty.	15 1	Civil Engineering Ty. (LA + RY)	Civil/Structural Eng.	18 15

Figure 1

ONTARIO UNIVERSITIES	No. of Bac. Pgms.	ONTARIO CAATS	No. of Pgms.	LAKEHEAD & RYERSON	POLYTECHNICS OF ENGLAND & WALES	No. of Programs	
						Degree	H.N.D.
Civil Engineering..		Civil (Municipal) Eng. Ty. Civil (Public Works) Eng. Ty. Civil (Surveying) Eng. Ty. Civil (Transportation) Eng. Ty. Construction Engineering Ty. Construction (Management) Eng. Ty.	1 1 1 1 3 1				
Computer Engineering	2	Computer Engineering Ty. Computer Systems/Control Engineering Ty.	1 1		Communication Engineering	3	-
Electrical Engineering	10	Control (Power Systems) Eng. Ty. Control (Systems) Engineering Ty. Electrical (Elect. Power) Eng. Ty. Electrical (Power) Eng. Ty. Electrical Engineering Ty. Electronics (Biomedical) Eng. Ty. Electronics (Computer Systems) Eng. Ty. Electronics (Computer) Eng. Ty. Electronics Engineering Ty. Electronics (Nuclear Power and Control) Engineering Ty. Electronics (Power Control) Engineering Ty. Electronics (Telecommunications) Engineering Ty.	1 1 1 4 6 1 1 1 18 1 1 1 1		Computer Technology Control & Instrumentation	2 7	- 5
				Electrical Engineering Ty. (LA + RV)	Electrical	22	23
				Electronics Eng. Ty. (LA)	Electronics	22	23

<u>ONTARIO UNIVERSITIES</u>		<u>ONTARIO COLLEGS</u>		<u>LAKEHEAD & RYERSON</u>		<u>POLYTECHNICS OF ENGLAND & WALES</u>	
No. of Bac. Pgms.		No. of Pgms.		No. of Pgms.		No. of Programs Degree	H.N.D.
Electrical Engineering..	Engineering Management	5	Electronics (Video) Eng. Ty.	1			
	Engineering & Mathematics	2	Electro-Mechanical (Cybernetics) Engineering Ty.	1			
	Engineering Chemistry	2	Electro-Mechanical Eng. Ty.	1			
	Engineering Physics	3	Energy Systems Engineering Ty.	1			
	Engineering Science	2	Fluid, Power Engineering Ty.	1			
	Environmental Engineering	1	Food (Processing) Eng. Ty.	1			
	Fluid & Thermodynamic Processes and Design Eng.	1			Engineering Technology (IA)	Engineering Science	2
	Geological Engineering	2				Environmental Engineering	3
	Geophysical Engineering	1					
	Industrial Engineering	1					
Industrial Engineering			Geological Engineering Ty.	2			
			Industrial Engineering Ty.	1			
			Industrial (Laboratory) Eng. Ty.	1			
Industrial Engineering			Industrial (Management) Eng. Ty.	3			
					Industrial Engineering Ty. (RY)	Industrial/Production	15
Illumination/Vehicle							

<u>ONTARIO UNIVERSITIES</u>		<u>ONTARIO COLLEGS</u>		<u>LAKEHEAD & RYERSON</u>		<u>POLYTECHNICS OF ENGLAND & WALES</u>	
<u>No. of Bac. Prgrms.</u>		<u>No. of Prgrms.</u>		<u>No. of Prgrms.</u>		<u>No. of Programs Degree H.N.D.</u>	
Industrial Engineering...		Industrial (Tech. Sales) Eng. Ty.	1				
		Instrumentation (Industrial) Engineering Ty.	3				
		Instrumentation (Process Control) Engineering Ty.	1				
Manufacturing Engineering	1	Manufacturing Engineering Ty.	1				
		Marine Engineering Ty.	2				
Materials Engineering	1						
Materials Science	2						
Mechanical Engineering	10	Mechanical (Design) Eng. Ty.	1				
		Mechanical Engineering Ty.	14				
		Mechanical (Industrial) Eng. Ty.	1			Mechanical	26
		Mechanical (Manufacturing) Engineering Ty.	1			(LA + RY)	
		Mechanical (Mobile Equipment) Engineering Ty.	1				
		Mechanical (Nuclear) Eng. Ty.	1				
Metallurgical Engineering	3	Metallurgical Engineering Ty.	2			Metallurgical Engineering Technology (RY)	
Mineral Engineering	1						
Mining Engineering	1	Mining Engineering Technology	2				Mining
							1
							3

<u>ONTARIO UNIVERSITIES</u>	<u>No. of Bac. Pgms.</u>	<u>ONTARIO CAATS</u>	<u>No. of Pgms.</u>	<u>LAKEHEAD & RYERSON</u>	<u>POLYTECHNICS OF ENGLAND & WALES</u>	<u>No. of Programs Degree H.N.D.</u>
		Motive Power Engineering Ty.	1			
Nuclear & Thermal Power	1				Naval Architecture	2
						1
Water Resources Eng.	1	Resources (Air & Water) Eng. Ty. Resources (Environmental) Engineering Technology Resources (Marine) Eng. Ty.	1 1 1 1			
		Safety Engineering Ty.	1			
Survey Science	1					
		Textile Engineering Ty.	1			
		Welding Engineering Ty.	1			
					<u>Interdisciplinary Courses</u>	
					Engineering & Business	4

Sources: A. Wilkinson, A Comparison of Polytechnic Education in England and Wales with Polytechnic Education in Ontario, (Toronto: Ministry of Colleges and Universities, February, 1980).
Association of Colleges and Universities of Canada, Directory of Canadian Universities, 1979.
Ministry of Colleges and Universities, Horizons, 1980-81.

3.2 PROGRAMS IN BUSINESS AND BUSINESS-RELATED STUDIES

Post-secondary programs in business, management and administrative studies are highly variable. The field is very broad and, in many respects, interdisciplinary in nature. Certain subjects are normally considered part of the study of business, management and administration, viz: economics, accounting, marketing, mathematics and statistics, administration, computer science and data processing, industrial relations, operations research, law, political science, and the social sciences. Many programs based upon differing emphases or in varying clusters of subjects are possible within this broad field of study.

Figure 2 sets out the programs available in business and business-related studies in Ontario universities and colleges of applied arts and technology. Because of the importance assumed by the M.B.A. program in North America, we have included graduate university programs in Figure 2. For comparative purposes, the 1978 business and related programs of the polytechnics of England and Wales are included. The table suggests that both college and university offerings in Ontario are extensive and are "polytechnic" in the breadth of their scope. Between them, the coverage is as broad as that of the polytechnics of England and Wales.

Breadth of coverage does not, of course, tell the complete story. What about the depth of studies? Depth is a very difficult concept to measure. One measurement is program duration. The programs in business and related studies in Ontario include 1-3 year diploma programs in the colleges, 3-4 year bachelor's degree programs as well as masters' and doctoral level programs. Ryerson offers both diploma and degree programs as well. But length of program is not a completely satisfactory yardstick. Does a three-year CAAT diploma program really differ from a three-year university degree program with the same cluster of subjects within it? There are undoubtedly

differences in "rigour", in the emphasis on quantitative subjects, in admission standards and so on. Because of the linkage with the professions, the field of accounting per se does permit a rough categorization of programs in terms of "level". In general, however, programs in this field are highly variable both in scope and depth. It is difficult in this field to discern or describe a distinctly middle or "polytechnic" stratum between the colleges and the universities. Instead, we see multiple overlapping strata with possibilities for many different permutations and combinations of studies.

We do, however, note a considerable overlap between the universities, colleges and Ryerson in this field. We ask whether the extensive overlap does not indicate duplication and is not an argument for more consultation and co-ordination between the levels to ensure an adequate response to industrial needs.

PROGRAMS IN BUSINESS, MANAGEMENT AND RELATED STUDIES
IN ONTARIO UNIVERSITIES AND COLLEGES OF APPLIED ARTS & TECHNOLOGY
AND THE POLYTECHNICS OF ENGLAND & WALES

ONTARIO UNIVERSITIES	No. of programs				Doc.	ONTARIO CAATS		No. of Prgrms.	Duration	POLYTECHNICS OF ENGLAND & WALES	No. of Programs	
	Dip.	Bac.	Mstrs.								Degree	H.N.D.
Accounting	1	9	1	-	-	Accounting Accountancy		25 3	2-3 Yrs. Sht. Prgm.	Accounting/Finance	25	2
Actuarial Science	-	3	-	-	-							
Administration	2	10	4	1	1	Human Services Administration Municipal/Public Admin./ Government Services Personnel Administration/ Labour Relations Legal/Office Administration/ Assistant		1 4 4 10	2 Yrs. 1-3 Yrs. 2-3 Yrs. 1-3 Yrs.	Personnel Administration Public/Social Administration	3 14	- 5
Arts Management & Administration	-	-	1	-	-	Fine Arts & Crafts/Admin.		9	1-3 Yrs.			
Business Adminis- tration	2	11	7	5	5	Business Administration Business General Business/Marina/Recreation Vehicle/Motor Carrier Admin. Corporate Administration Industrial Admin./Management Retail Admin./Management Wholesale Administration		24 19 3 1 4 7 1	2-3 Yrs. 2-3 Yrs. 1-2 Yrs. 3 Yrs. 3 Yrs. 1-2 Yrs. 2 Yrs.	Business Studies	29	30

Figure 2

- 2 -

<u>ONTARIO UNIVERSITIES</u>	<u>Dip.</u>	<u>Bac.</u>	<u>Mstrs.</u>	<u>Doc.</u>	<u>ONTARIO CAATS</u>	<u>Prgm.</u>	<u>Duration</u>	<u>POLYTECHNIC</u>	<u>Degree</u>	<u>H.N.D.</u>
Business Administration & Law (Combined Prgm.)	-	-	1	-						
Commerce	-	9	1	-						
Commerce & Law (Combined Program)	-	-	1	-						
Correctional Admin.	-	-	1	-						
Development Studies	-	-	1	-						
Finance	-	6	3	2	Finance Finance	11 1	2-3 Yrs. 2 Yrs.	Accountancy/Finance	25	2
Health Services Admin.	-	1	2	1	Health/Records Mn/Admin.	4	1-2 Yrs.			
Hospital Administration	-	-	-	2						
Hotel Administration	-	1	-	-	Hotel/Motel/Restaurant Management, Operation	10	2-3 Yrs.	Hotel, Catering and Institutional Management	4	9
Human Resources Management	-	-	1	-	Human Resources Management	2	2 Yrs.			

ONTARIO UNIVERSITIES

Dip. Bac. Mstrs. Doc. ONTARIO CAATS Prgm. Duration POLYTECHNIC Degree H.N.D.

Industrial Relations

- 2 1 - Industrial Relations 1 3 or less

International Business

- 1 1 - International Business 1 3 Yrs. International Relations 2 -

Labour Relations

- 2 - Personnel Administration/
Labour Relations 4 1-3 Yrs.

Management

- 4 4 2 Construction Management/
Residential 1 2 Yrs. Hotel, Catering and Institutional 4 9
Farm/Business Management 2 2 Yrs.
General Management 5 2-3 Yrs.
Industrial Admin./Mgmt. 4 3 Years
Materials Management 2 3 Yrs.
Production and/or Operating
Management 2 3 Yrs.

Management Information
Systems

- 1 1 -

Management/Operations
Management

- 1 - -

Marketing

- 6 3 2 Marketing 24 2-3 Yrs. Marketing 15 5
Retail Marketing 8 2-3 Yrs.
Sales and Merchandising 3 1-2 Yrs.

<u>ONTARIO UNIVERSITIES</u>	<u>Dip.</u>	<u>Bac.</u>	<u>Mstrs.</u>	<u>Doc.</u>	<u>ONTARIO CAATS</u>	<u>Prgm.</u>	<u>Duration</u>	<u>POLYTECHNIC</u>	<u>Degree</u>	<u>H.N.D.</u>
Municipal Administration	1	-	-	-	Municipal/Public Admin./ Government Services	4	1-3 Yrs.			
Operations Research	-	1	1	-				Operational Research	5	-
Organizational Theory & Behavior	-	2	1	2						
Public Administration	2	5	3	1	Municipal/Public Admin./ Government Services	4	1-3 Yrs.	Public/Social Administration	14	5
Quantitative Methods	-	4	1	-						
Restaurant Administration	-	1	-	-	Restaurant/Hotel/Motel Operation/Management	10	2-3 Yrs.			

SOURCES: Association of Universities and Colleges of Canada, Directory of Canadian Universities, 1979, Ottawa, Ontario,
 Ontario Ministry of Colleges and Universities, Horizons 1980-81, Toronto, Ontario.
 A. Wilkinson, A Comparison of Polytechnic Education in England and Wales with Polytechnic Education in Ontario,
 (Toronto: Ministry of Colleges and Universities, February, 1980).

3.3 PROGRAMS IN COMPUTING, DATA PROCESSING AND RELATED STUDIES

The computer industry requires a broad range of skills and draws upon a wide range of educational preparations. In a typical computing facility, there may be the following functions: systems analysis, programming, operations, management, data base administration, operations research and telecommunications.

The systems analysts must have some grasp of programming and of the capabilities and limitations of the computing facility. They may also need a more broadly based academic background to give them an understanding of the subject matters, the industry, etc. that they are dealing with to make them effective in determining information needs and developing systems specifications. One of their more important skills is reasoning ability which may be nurtured in a variety of disciplines. Degree studies may be an important asset in this occupational setting.

The programming function takes the systems design and produces detailed machine instructions. Here certain specific skills are essential, such as analytic reasoning ability, and the ability to concentrate on small details. Again, many different educational programs at many different levels could develop these skills, although the programming languages may need to be acquired in programs specifically designed for that purpose. A degree may or may not be important depending on the specific tasks to be performed. The operations function may draw principally from those who have acquired specific technical knowledge about programming and operational routines. Breadth of knowledge or exposure to theoretical disciplines may be less important. Management functions, however, will need both technical competence and a background in managerial skills acquired in part from studies of administration, economics and statistics.

Educational programs to prepare persons for employment in the computing industry and firms with computing facilities, are highly variable and interdisciplinary. The basic technical hardware and

technology may be developed out of the electrical engineering disciplines as well as programs in electrical and electronic technology. Computer programming and information systems may draw upon basic and applied mathematics or other basic sciences. Computer science has developed into a discipline in itself as has the study of computer science technology. Computer programming may be offered as part of these disciplines, but there are educational programs in programming itself.

In this field, therefore, there are many disciplines functioning at many levels. Educational programs in Ontario have been rigidly stratified into a "college" level and a "university" level with a small intermediate level operating at Ryerson Polytechnical Institute. But we have in the industry a continuum of skills, and the supporting educational programs are also de facto continuous from one-year diploma programs, to 2-3 year diploma programs, to 3-4 year bachelors' programs, to masters' and finally doctoral level programs with multiple overlaps between them. In view of the continuous nature of the needs of industry, should the educational programs not be reviewed and possibly coordinated on a broader basis drawing together colleges, Ryerson and the universities?

At this point, however, we return to the question of the adequacy of the coverage of programming in Ontario institutions. Figure 3 lists the programs in computing, data processing and related disciplines in Ontario universities and colleges of applied arts and technology. The 1978 programs in polytechnics of England and Wales are included for comparison purposes. The offerings of Ontario institutions are "polytechnic" in the breadth of their scope. They appear to be as extensive as the English polytechnics.

The matter of depth, however, is impossible to measure in the absence of widely accepted criteria and measurement techniques. However, as we have noted above, the duration of programs extends from the 1-year diploma to the doctoral degree.

PROGRAMS IN COMPUTER SCIENCE AND RELATED STUDIES IN
ONTARIO UNIVERSITIES AND COLLEGES OF APPLIED ARTS AND TECHNOLOGY
AND THE POLYTECHNICS OF ENGLAND AND WALES

ONTARIO UNIVERSITIES	No. of Programs			Doc.	ONTARIO CAATS	No. of Prgrs.	Duration	POLYTECHNICS OF ENGLAND & WALES	No. of Programs	
	Dip.	Bac.	Mstrs.						Degree	H.N.Q.
Computational Science	-	-	1	-	Computer (Computing Sc.) Ty.	1	3 Yrs.			
Computer Mathematics	-	1	-	-						
Computer Science	1	12	4	2	Computer (Science) Ty.	2	3 Yrs.	Computer Science/Studies	23	22
Computer Science & Biology (Combined Prgm.)	-	1	-	-						
Computer Science & Chemistry (Combined Prgm.)	-	1	-	-						
Computer Science & Physics (Combined Prgm.)	-	1	-	-						
Computing & Data Proc.	-	-	1	1	Computer (Data Processing) Tn. Computer Operations and Analysis/Data Processing Electronic Data Processing Data Entry Operator	1	2 Yrs.			
Computing & Informa- tion Science	-	2	1	-	Information Processing	2	1½-2 Yrs.			

Figure 3

ONTARIO UNIVERSITIES	No. of Programs			ONTARIO CAATS	No. of Prgrms.	Duration	POLYTECHNICS OF ENGLAND & WALES	No. of Programs	
	Dip.	Bac.	Mstrs.					Degree	H.N.O.
Computer Engineering	-	2	1	1	Electronics (Computer Systems) Engineering Ty.	1	3 Yrs.	Computer Technology	2
					Electronics (Computer) Eng. Ty.	1	3 Yrs.	Computing & Bus. Studies/Economics	5
					Electronics (Computer) Eng. Tn.	1	2 Yrs.	Control and Instrumentation	7
					Control (Computer Systems) Engineering Ty.	1	3 Yrs.		
					Computer Engineering Tn.	1	2 Yrs.		
					Computer Engineering Ty.	1	3 Yrs.		
					Computer Systems Ty.	1	3 Yrs.		
					Computer Programmer/Operator/Techniques	2	1-3 Yrs.		
					Computer Systems Analysis	4	3 Yrs.		
					Electro-Mechanical (Cybernetics) Engineering Ty.	1	3 Yrs.		

SOURCES: Association of Universities and Colleges of Canada, Directory of Canadian Universities 1979, Ottawa, Ontario.
 Ontario Ministry of Colleges and Universities, Horizons 1980-81, Toronto, Ontario
 A. Wilkinson, A Comparison of Polytechnic Education in England and Wales with Polytechnic Education in Ontario,
 (Toronto: Ministry of Colleges and Universities, February, 1980).

4.0 MANPOWER SUPPLY AND DEMAND

Statistics Canada labour force surveys have repeatedly indicated lower unemployment rates among youth with degrees and other post-secondary credentials than those without (see Table 3). Degree holders tend to enjoy a slight edge over those who have other post-secondary credentials. But there is still some unemployment among graduates, which suggests that while unemployment is less of a problem for post-secondary graduates, there is no general shortage of post-secondary graduates in relation to current requirements.

We must look to more detailed information to discover whether there are shortages of graduates in specific fields. Such shortages may indicate inadequacies in programming. The Statistics Canada survey of 1976 university and college graduates in Canada¹ indicated that in 1978, about two years after graduation, full-time employment rates for university bachelors degree graduates stood at 88.8% compared with 90.0% for college graduates. The difference is not appreciable, and both categories indicate reasonably satisfactory employment levels. However, the data suggest that 10% or more were unemployed or employed only part-time.² This fact too supports the notion that there is no general shortage of graduates at either level.

A closer look at the data broken down by major field of study³ indicates considerable variance in employment rates (see Table 4). Full-time employment rates for bachelors graduates ranged from 95.6% (Business, Management and Commerce) to 70.7% (Fine and Applied Arts). Among college graduates, the full-time employment rates varied between 98.3% (Data Processing and Computer Science) and 77.6% (Fine, Applied and Performing Arts). For analytic purposes, we have adopted a full-time employment rate of 90% or over as a benchmark indicating a balanced to somewhat tight supply/demand market. Against this criterion, the following major fields of study may be considered to fall in the range of "balanced" to "somewhat tight".

¹Statistics Canada, "Employment of 1976 University and College Graduates," 4-2212-520, Ottawa.

²Of all 1976 graduates in the labour force in the week of May 28-June 5, 1978, 89.3% were employed full-time, 5.4% were employed only part-time and 5.3% were not employed and seeking employment.

³It should be noted that the fields of study employed for college graduates and university graduates are not completely comparable. For example, university computer science programs were subsumed under mathematics and physical sciences.

<u>Universities</u>	<u>Full-Time Employment Rate</u>	<u>Colleges</u>	<u>Full-Time Employment Rate</u>
Business, Management and Commerce	95.6	Business Management and Commerce	92.1
Engineering and Applied Science	94.3	Engineering and Related Technology	93.9
Health Professions	95.5	Data Processing and Computer Science	98.3
Education	90.1	Secretarial Sciences	91.8
		Primary Industries	91.7
		Transportation	94.7
		Applied Sciences	96.2
		Trades and Crafts	91.8

Incidentally, by this criterion, many post-baccalaureate programs are in a "balanced" to "tight" supply situation and some doctoral programs (e.g. business management, engineering) are in critically short supply.

<u>Masters</u>		<u>Doctoral</u>	
Business Management	97.4	Business Management	100.0
Education	94.8	Education	93.6
Engineering and Applied Science	94.9	Engineering and Applied Science	100.0
Health Professions	91.9	Health Professions	100.0 ¹
		Social Sciences	94.5
		Mathematics and Physical Sciences	92.4

Graduate employment surveys, therefore, indicate a general balance between supply and demand but with wide variances between fields. While many of the fields with the greatest shortages are in professional or career-oriented programs, one should remember that the English and Ryerson models of

¹M.D. Programs are included here.

polytechnic education embrace a wide spectrum of courses including such fields as community services, fine, applied and performing arts and mass communications. In many of these fields, the graduate surveys indicate relatively low full-time employment rates and in some cases a severe oversupply. Furthermore, a career-orientation does not guarantee immediate access to a related career as the annual Ontario college placement report indicates. Appendix B was based on the 1978-79 Graduate Placement Report. It shows the percentage of 1978-79 CAAT graduates in each program who though available for work, were still looking for work as of November 15, 1979. Summarized by division, the proportion of graduates still looking for work were:

Percent Still Looking For Work

<u>Division</u>	<u>1 Year Programs</u>	<u>2 Year Programs</u>	<u>3 Year Programs</u>	<u>All Programs</u>
Applied Arts	19.3	11.8	11.6	12.0
Business	13.4	9.2	6.5	9.4
Health	13.9	15.4	15.2	15.0
Technology	<u>7.9</u>	<u>6.1</u>	<u>6.8</u>	<u>6.5</u>
All	13.1	10.7	8.5	10.6

There were more than 400 programs in the placement report; in more than 115 programs, the per cent still looking for work was 10% or higher. Not surprisingly, the lowest percentages of unemployed occurred in technology and business programs.

Another important source of information about manpower requirements are surveys of the needs of industries. Employment and Immigration Canada publishes quarterly, short-term forecasts of manpower imbalances in a report called the Forward Occupational Imbalance Listing. There are many serious limitations to this source and one must interpret data from it cautiously. For example, omission of an entry for an occupation does not necessarily mean an expected balance between supply and demand for workers but rather may mean an absence of data sufficient to form a reasonably

informed and reliable judgement about future developments. Figure 4 lists the occupations in which the January 1980 F.O.I.L. report indicated there were shortages in Ontario. The names of occupations showing both a surplus and a shortage were omitted from the list. These occupations were omitted on the assumption that a shortage in one part of the province is balanced by a surplus in another.

Most of the occupations with shortages are in the trades or skilled worker categories. Preparation for these occupations would not normally be provided in universities, in the post-secondary diploma programs of the CAATs or in the English model of polytechnics. However, some professional or semi-professional occupations with shortages are listed: viz., accounting, some engineering fields and computer related occupations. In this respect, the F.O.I.L. report findings are consistent with the graduate employment surveys.

In the summer of 1979, the Ontario Manpower Commission conducted a survey of 5,770 manufacturing firms. Only 1,153 firms responded and the resulting conclusions are considered by the Commission to be an accurate assessment of the information reported by the responding firms only. Figure 5 lists the occupations which accounted for more than 2/3 of the current shortages. Again, most of these occupations are in the trades, skilled or unskilled worker categories which are outside the CAAT post-secondary, university, and the English model of polytechnic programming. However, two professional or semi-professional areas are mentioned, engineering and general and systems analysts. This information too is congruent with the data from the January, 1980 F.O.I.L. report and with the graduate surveys. The O.M.C. survey also asked manufacturers to report those occupations in which they expected recruiting to be either "somewhat" or "very" difficult. The most frequently mentioned occupations are listed in Figure 6.

The Pay Research Bureau of the Public Service Staff Relations Board also surveys employers to ascertain current demand for university and

college graduates. In a recent report,¹ the Bureau indicated that 27 out of 80 organizations anticipated shortages of university graduates primarily in engineering and to a lesser degree, the computer science field. It also reported that eight out of 52 organizations predicted shortages of community college graduates, primarily technologists.

Preliminary data have recently been reported from the Human Resources Survey of the Economic Council of Canada.² The survey gathered data from 1,400 establishments on the skill shortages facing them. Betcherman reports that the most serious, current and prospective shortages fall in three categories. Firstly, product fabricating and repairing jobs posed foremost difficulty, representing about 20% of shortages. Secondly, about 13% of shortages are in machining and related occupations. A third category is in the natural sciences, engineering and mathematics occupations, accounting for about 12%. In the last category, the following occupations are most prominent: most types of engineers, draughtsors, engineering technicians and computer programmers/analysts. The report also demonstrated a very sharp decline in immigration into these three employment categories in the period 1973-1978. It concluded that "...search outside Canada is now rarely employed as a shortage solution. In the majority of cases, vocational training was adopted as a response to hiring problems."

As Betcherman indicates, immigration as a source of skilled workers, particularly in the fields where there are shortages, has diminished greatly. What is the pattern of international immigration into Ontario? Table 5 shows that in 1979, approximately 51,763 immigrants entered Canada destined for Ontario. However, only 22,381, or 43% entered as workers. The balance were dependents, students, retired people, etc. Of course, not all workers entered

¹Canada. Pay Research Bureau, Public Service Staff Relations Board, Anticipated Recruiting Rates for 1980 University and Community College Graduates, No. 140-80, Ottawa, 1979.

²G. Betcherman, Economic Council of Canada, "Matching Labour Skills to Job Requirements", May, 1980.

Canada under the independent class. Persons entering under the independent class do so purely on the basis of their individual job skills and other qualifications in relation to Canadian labour market needs. As the data indicates, nearly three-quarters of all immigrant workers entered Canada destined for Ontario under one of the following classes: assisted relative, family class, convention refugees, or other designated classes. Only 5,914 workers, or 26.4% of all immigrant workers entered Canada destined for Ontario under the independent class, a remarkably small number.

As we can see, immigration data must be interpreted cautiously. An influx of immigrants into particular occupations does not necessarily mean shortages of Canadian workers in those occupations. As long as Canada receives immigrants, there will be a supply of new workers in many occupations, because many will qualify by reason of their family ties, refugee status, etc., in addition to those who qualify purely on the basis of their qualifications and skills and the demand for those skills. Table 6 indicates the occupations into which worker immigrants, both independent and other, entered. First, we note the small proportion of independent immigrants. Workers who entered Ontario under the independent class represented only 28% of all worker immigrants. (Only 12.9% of worker immigrants entered with pre-arranged employment.) The largest numbers are in occupations which have earlier been identified as experiencing shortages, e.g. engineering, business administration, some trades and other skilled worker categories. In all of these fields, Ontario now has university, college and other post-secondary programs. There is nothing to indicate that needs could not be met by an expansion of current programs, unless the need is for a particular type of skill and a particular length of experience to meet unusual circumstances. The data do not indicate whether the independent workers were brought in on the basis of their experience.

The educational backgrounds of immigrants destined for Ontario in 1979 is indicated in Table 7. There is no specifically polytechnic level in the data of the Canada Employment and Immigration Commission. The trades and apprenticeship categories are not included in most models of polytechnic education. The category of trade, certificate, diploma or apprenticeship could not be regarded as representing polytechnic education. There is, therefore, nothing in the immigration data to indicate whether current post-secondary programs are sufficiently polytechnic.

In sum, therefore, most of the current shortages appear to be in the trades or skilled worker categories. In the professional and semi-professional occupations for which the universities, the polytechnics and CAAT post-secondary programs prepare people, most fields appear to be in a general demand/supply equilibrium. However, the surveys generally converge on a few areas where shortages exist, namely engineering, accounting and other business careers and computer-related occupations. Since both the universities and the colleges as well as Ryerson Polytechnical Institute offer programs in these fields, it is difficult to argue that the potential for meeting needs is not there or that there are gaps in programming which prevent needs from being met. If needs are not met, the problem may be a function of limitations on institutional capacity rather than gaps in programming. Recent enrolment data suggest that enrolment in college and university programs in these program areas has been growing, presumably in response to these needs (see Table 8).

Table 3

CANADA
ESTIMATES OF UNEMPLOYMENT
BY EDUCATIONAL ATTAINMENT
1979 - ANNUAL AVERAGE
15-24 YEAR OLDS

<u>EDUCATIONAL ATTAINMENT</u>	<u>UNEMPLOYMENT RATE</u>
0 - 8 Years	23.0
High School	13.7
Some Post-Secondary	9.4
Post-Secondary Certificate or Diploma	8.7
University Degree	7.1

SOURCE: Statistics Canada, The Labour Force, Feature
1979 Annual Averages, December, 1979,
Catalogue No. 71-001 Monthly.

CANADA
FULL-TIME EMPLOYMENT RATES
OF 1976 UNIVERSITY AND COLLEGE GRADUATES
WHO WERE IN THE LABOUR FORCE DURING WEEK OF MAY 28 - JUNE 3, 1978
BY FIELD OF STUDY AND QUALIFICATION LEVEL

UNIVERSITY BACHELORS GRADUATES		COLLEGE DIPLOMA GRADUATES	
FIELD OF STUDY	%	FIELD OF STUDY	%
Business Management & Commerce	95.6	Business Management & Commerce	92.1
		Secretarial Sciences	91.6
		Data Processing & Computer Science	98.3
Engineering & Applied Sciences	94.3	Engineering & Related Technologies	93.9
		Primary Industries	91.7
		Applied Sciences	96.2
Agricultural & Biological Sciences	87.6	Transportation	94.7
Mathematics & Physical Sciences	89.0		
Health Professions	95.5	Trade & Crafts	91.8
Social Sciences	87.0	Medical & Dental Services	88.2
Fine & Applied Arts	70.7	Community Services, Social Welfare & Household Sciences	88.6
Humanities	86.5	Fine, Applied & Performing Arts	77.6
Education	90.1		
		Mass Communications	88.6
General (no specialization)	87.8	General Arts & Science, Education and Law	82.1
TOTAL	88.8		90.0

SOURCE: Statistics Canada, Employment of 1976 University and College Graduates,
4-2212-520.

Table 4

Table 5

LANDED IMMIGRANTS DESTINED
TO ONTARIO
1979¹

	Independent Class	%	Other Classes*	%	Total
Workers	5,914	26.4	16,467	73.6	22,381
Non-Workers**	5,855	19.9	23,527	80.1	29,382
<u>Total</u>	11,769	22.7	39,994	77.3	51,763

SOURCE: Employment and Immigration Canada, Print-out PD076(01),H-1
V-002, June 9, 1980.

¹Preliminary data.

* Assisted relatives, family class, convention refugees, and designated classes.

** Spouses, dependent children, students, retired/others.

Table 6

LANDED IMMIGRANTS DESTINED TO ONTARIO-
WORKERS BY OCCUPATIONAL GROUPS
1979¹

Grouped Occupation	Independent Class		Other Classes		Total	
Fabricating, Assembling, Repair	529	(206)	2,411	(41)	2,940	(247)
Clerical	642	(32)	2,027	(47)	2,669	(79)
Service	513	(298)	1,087	(76)	1,600	(374)
Natural Science, Engineering, Mathematics	914	(344)	664	(30)	1,578	(364)
Machining	616	(429)	607	(23)	1,223	(452)
Manager, Administrator	823	(406)	332	(28)	1,155	(434)
Construction	127	(18)	869	(27)	996	(45)
Medicine - Health	258	(52)	582	(15)	840	(67)
Sales	178	(27)	582	(21)	760	(48)
Farming, Horticulture, Animal Husbandry	184	(39)	379	(10)	563	(49)
Teaching	177	(86)	332	(10)	509	(96)
Artist, Literary - Performing Artist	128	(42)	228	(12)	356	(54)
Other Classified	410	(237)	1,095	(56)	1,505	(293)
Not Classified	101	(1)	3,387	(2)	3,488	(3)
<u>Totals</u>	5,600	(2,207)	14,582	(398)	20,182	(2,605)
%	27.7		72.3		100.0	

SOURCE: Canada Employment and Immigration Commission, Computer
Print-out, PD053(02), R-1, V-001, June 7, 1980.

¹ Preliminary data.

Note: (1) Numbers in parentheses indicate immigrants who had pre-arranged
employment.

(2) Includes only those admitted pursuant to The Immigration Act,
1976.

Table 7

IMMIGRANTS* ADMITTED TO CANADA
DESTINED TO ONTARIO IN 1979-
WORKERS BY EDUCATIONAL ATTAINMENT¹

Educational Attainment	Independent Class	Other Classes	All Classes		%
University	1,753	2,181	3,934	(865)	19.4
Other Post-Secondary Non-University	757	1,012	1,769	(259)	8.8
Trade, Certificate, Diploma or Apprenticeship	1,549	1,837	3,389	(818)	16.8
Other	1,541	9,552	11,093	(663)	55.0
Total	5,600	14,582	20,182	(2,605)	100.0

SOURCE: Canada Employment and Immigration Commission, Print-out
PD053(02), H-1, V-001, June 7, 1980.

¹Preliminary data.

NOTE: Numbers in parentheses indicate those who entered with
pre-arranged employment.

* Includes only immigrants admitted pursuant to The Immigration Act, 1976.

Table 8

FIRST YEAR ENROLMENT IN UNDERGRADUATE ENGINEERING, ENGINEERING TECHNOLOGY, COMMERCE AND BUSINESS
ADMINISTRATION AND COMPUTER SCIENCE AT ONTARIO UNIVERSITIES, RYERSON AND COLLEGES OF APPLIED ARTS AND TECHNOLOGY

FALL TERM	Engineering & Engineering Technology						Commerce & Business Administration						Computer Science ¹					
	Universities			Ryerson			CAATS			Universities			Ryerson			CAATS		
	No.	% Change		No.	% Change		No.	% Change		No.	% Change		No.	% Change		No.	% Change	
1974	3054			590			2016			1848			614			8850		433
1975	3287	+7.6		656	+11.2		2072	+2.8		1895	+2.5		641	+4.4		9315	+5.3	448 +3.5
1976	3231	-1.7		752	+14.6		2146	+3.6		2175	+14.8		684	+6.7		10122	+8.7	491 +9.6
1977	3186	-1.4		674	-10.4		2394	+11.6		3258	+49.8		673	-1.6		11253	+11.2	572 +16.5
1978	3840	+17.0		765	+13.5		2562	+7.0		3768	+15.7		631	-6.2		12464	+10.8	671 +17.3
% Change 1978 over 1974		+25.7			+29.7			+27.1						+2.8			+40.8	+55.0

SOURCES: Ministry of Colleges and Universities, Statistical Summaries, Ontario College Information System,
and Ryerson Polytechnical Institute.

¹ Only enrolment figures for the colleges are readily available.

Figure 4

ONTARIO
OCCUPATIONS IN JANUARY, 1980
FORWARD OCCUPATIONAL IMBALANCE LISTING
SUMMARY OF MANPOWER SHORTAGES*

<u>OCCUPATION</u>	<u>MANPOWER REQUIREMENT</u> (Light/Moderate/Extreme)
Accountant	Light
Electrical Engineering	Light
Industrial Engineering	Moderate
Mechanical Engineering	Light
Aerospace Engineering, Design & Development	Light
Electrical Draftsman	Light
Systems Analysts, Computer Programmers and Related Occupations	Moderate
Dental Hygienists, Assistants & Technicians	Light
Door-to-Door Salesperson	Light
Salesperson, Life Insurance	Light
Salesperson, Insurance	Light
Logger, All-Round	Light
Foreman, Filtering, Straining & Separating Occupations	Light
Tool & Die Maker	Moderate
Patternmaker, Metal	Light
Machinist, General	Moderate
Milling - Machine Set-up Operator	Moderate
Machine - Tool Operating Occupations	Light
Metalworking - Machine Set-up Man	Light
Welder - Fitter	Light
Machine Builder	Light
Cabinet Maker	Moderate
Construction Equipment Mechanic	Moderate
Diesel Mechanic	Light
Precision - Instrument Mechanic & Repairman	Light
Painting & Decorating Occupations, (except Construction)	Light
Maintenance Man, Factory or Mill	Light
Stationary Engineer	Moderate

*Excludes occupations in which manpower requirements are balanced by surpluses.

SOURCE: Employment & Immigration Canada,
Forward Occupational Imbalance Listing
Vol. 5, No. 4, January 31, 1980.

ONTARIO
CURRENT MANPOWER SHORTAGES
IN MANUFACTURING FIRMS WHICH RESPONDED TO
ONTARIO MANPOWER COMMISSION SURVEY*

Almost 68% of current job openings in those industries that responded to the Survey are in the following 11 broad categories of occupations:

<u>OCCUPATION</u>	<u>TYPE</u>	<u>NUMBER OF POSITIONS</u>
Machine Operator	Skilled Worker	401
Tool/Die/Mould/Cabinet Maker	Trade	250
Machinist: General	Trade	333
Labourer	Unskilled Worker	189
Engineer	Profession	187
Welder	Trade	138
Assembler	Skilled Worker	89
Welder: Fitter	Trade	83
Assembler: Fitter	Trade	81
Electrician	Trade	79
General & Systems Analyst	Skilled-Profesional	70

SOURCE: Ontario Manpower Commission, Manpower Requirements and Hiring Plans of Ontario Employers in Manufacturing Industries, October, 1979.

*NOTE: Response rate in the Survey was very low. Results are generalizable only to the 1,153 (20%) firms which responded.

Figure 6

ONTARIO
OCCUPATIONS IN WHICH RECRUITING IS EXPECTED
TO BE "SOMEWHAT" TO "VERY" DIFFICULT ACCORDING TO INDUSTRIES
RESPONDING TO ONTARIO MANPOWER COMMISSION SURVEY OF MANUFACTURERS*

<u>OCCUPATION</u>	<u>TYPE</u>
Machinist: General	Trade
Assembler: Electronic	Skilled Worker
Welder: Industrial	Trade
Manager: Administrator	Skilled - Professional
Foreman: Production Supervisor	Skilled - Professional
Assembler: Lead Hand	Skilled Worker
Assembler: General Production	Skilled Worker
Maker: Cabinet	Trade
Maker: Mould	Trade
Maker: Tool & Die	Trade
Millwright	Trade
Operator: Lathe	Skilled Worker
Operator: Press/Brake/Punch	Skilled Worker
Welder: Fitter	Trade
Electrician: General	Trade
Electrician: Wirer	Trade
Engineer: Electrical	Profession
Engineer: Electronic	Profession
Engineer: Research & Development	Profession

SOURCE: Ontario Manpower Commission, Manpower Requirements and Hiring Plans of Ontario Employers in Manufacturing, October, 1979.

*NOTE: Response rate in the Survey was low. Results are generalizable only to the 1,153 (20%) firms which responded.

5.0 EDUCATIONAL PROGRAMS AND THE PROFESSIONS

Whether a field of studies is placed in a CAAT or a university often depends upon the professional status of the related occupation and whether licensure follows graduation from the program. Licensure confers upon the individual the exclusive right to practise.

Certification confers upon the individual membership in a professional or occupational group and the right to the use of a restricted designation but not the exclusive right to practice. Licensure in medicine, pharmacy, law, dentistry, engineering and architecture requires a university degree. The Institute of Chartered Accountants similarly now requires a university degree.

On the other hand, graduates from a CAAT technology program may gain certification through membership in the Ontario Association of Certified Engineering Technologists and Technicians. Graduates of the accounting programs of the Society of Management Accountants or the Certified General Accountants Association of Ontario may be certified and entitled to use an exclusive designation (e.g. R.I.A. or C.G.A.) but are not given license to practise public accounting. In the latter two bodies, university graduation is not sine qua non for certification, but their preparatory educational programs may be taken in part at either the colleges or the universities. It is interesting to note that the Society of Management Accountants describes its program as "equivalent to a combination of post-secondary school undergraduate and graduate specialist study".¹ The C.G.A. program is also available in part through university or college study.

The recently issued Report of the Professional Organizations Committee² discusses the relationship between the professional and paraprofessional groups in many fields. It does not appear to advocate dismantling the present dichotomous structure of the professions and their related paraprofessional occupations. However, the report in general appears to argue for a strengthening of bridging mechanisms.

¹Ministry of Colleges and Universities, Ontario, Horizons, 1980-81.

²Ministry of The Attorney-General, Ontario, The Report of The Professional Organizations Committee, May, 1980.

The strengthening of bridging mechanisms is justified in part on the grounds of a considerable body of research which suggests that there is much substitution in tasks and functions in the work place between professionals and paraprofessionals, particularly in engineering and architecture.

The report calls for strengthened bridging mechanisms between engineers and technologists and between lawyers and their paraprofessionals. It goes much further in the case of accounting; it recommends giving the S.M.A.O. and the C.G.A.A.O. the right to prepare people for licensure in public accountancy.

If bridging is strengthened, the dichotomous structure may become less rigid. Educational programs supporting the professions and paraprofessions may reflect less and less the notion of quantum leap between university and non-university programs and more and more the notion of a continuum with strengthened opportunities for professional upgrading. If the dichotomy is weakened, and the continuum concept develops, it could be argued that there should be an expansion of some of these three-year technology programs into four-year programs. An example would be the CAAT technology programs as recommended in the report of Goodings et al. The Engineering Technologist¹.

Of considerable potential in terms of implications for post-secondary programming is the proposal of the Professional Organizations Committee to establish a general certification regime under government control. This measure would enable various occupational and paraprofessional groups to gain certification. If certification were to be based on claims of specialized knowledge or skill, there could be an increasing reliance on post-secondary training and certification. This strengthens the argument that more coordination in program planning between universities and colleges should be encouraged in career-oriented programs to respond to this potential.

¹Goodings, Sidlofsky, Goodings & Associates, The Engineering Technologist, (Streetsville, Ontario: April, 1975).

6.0 RESEARCH AND DEVELOPMENT

An important question facing post-secondary education in Ontario is the contribution of the institutions to research and development in Canada. At the present time research is not part of the mandate of either Ryerson or the colleges of applied arts and technology. It is a part, albeit a small part, of the English polytechnic system.

Investment in research and development in Canada lags well behind other countries. Canada is one of the few industrialized countries to spend less than 1% of G.N.P. on research and development. The financial contribution of the federal government to research has been increased in recent years. It is widely acknowledged, however, that a massive increase in investment on the part of the private sector is necessary to produce any marked shift in the pattern. Recently, the Minister of State for Science and Technology has indicated a strong determination to induce the private sector to increase its commitment to research and development and has renewed a previously stated commitment to raise the level of research and development in Canada.¹

A substantial increase in research and development activity would place demands on all engineering and technology programs although the preponderant burden would be felt at the university postgraduate level. High technology industries are reportedly hiring extensively from outside Canada at this level.² The Statistics Canada Survey of 1976 University and College Graduates indicates a critical shortage of doctoral graduates in engineering (see Table 9). The Survey of 1976 Doctoral Degree Recipients from Canadian Universities indicates that the majority of doctoral graduates in engineering have been absorbed into research, development or related activities. (See Table 10).

There is little basis for arguing that an increase in research and development activity would place a greater burden on a "middle" or "polytechnic" stratum of applied or technological programs. Most of the

¹The Globe & Mail, May 28, 1980.

²The Financial Times of Canada, Vol. 68, No. 12, August 27, 1979.

weight would probably be felt by the universities because their mission embraces research and graduate education. A recent study indicates very few research and development personnel have less than a Bachelor's degree. It also indicates a growing tendency for industry to staff research and development at higher degree levels in industry.¹

An important issue however, is whether the mandate to conduct basic and applied research should be extended to include Ryerson and some of the stronger technology programs in the colleges of applied arts and technology. Would Ontario's capabilities to work at the applied level be enhanced by broadening the mandate of Ryerson and some of the colleges? Such a move would not appear to be justified without a careful study of staffing and the resource implications. It should not be contemplated unless there is a clear indication of a definite and massive increase in research and development activity in Canada. A recent projection by the Ministry of State for Science and Technology indicates that if the current level of R & D expenditures is maintained at 0.95 per cent of GNP to 1985, there may well be a surplus of supply over requirements for research trained manpower of the order of 10,600.²

In Britain, the polytechnics have not moved massively into research. This fact suggests that without substantial adjustments, Ryerson and the colleges are unlikely to be able to assume a larger role in research.

¹Ministry of State, Science and Technology Canada, "Working Paper: The Supply of Research Trained Personnel - A Regional Analysis", May, 1980.

²Ministry of State, Science and Technology Canada, "Working Paper: Research Manpower Requirements arising from Accelerated Expenditures on R & D", April 1980.

Table 9

FULL-TIME EMPLOYMENT OF 1976 UNIVERSITY AND
COLLEGE ENGINEERING AND TECHNOLOGY GRADUATES
WHO WERE IN THE LABOUR FORCE DURING THE WEEK
OF MAY 28 - JUNE 3, 1978

	<u>%</u>
CAAT Diploma Graduates - Technology - 1 year program	90.1
CAAT Diploma Graduates - Technology - 2 year program	94.5
CAAT Diploma Graduates - Technology - 3 year program	92.9
All CAAT Diploma Graduates	93.9
University Bachelors' Graduates - Engineering	94.3
University Masters' Graduates - Engineering	94.9
University Doctoral Graduates - Engineering	100.0
All University Graduates	94.6

SOURCE: Statistics Canada, "Employment of 1976 University
and College Graduates", 4-2212-520.

Table 10

MAJOR ACTIVITY IN CURRENT EMPLOYMENT
OF 1976 DOCTORAL GRADUATES IN ENGINEERING
WHO WERE RESIDENT IN CANADA, DECEMBER, 1978

FIELD OF STUDY	MAJOR ACTIVITY								
	RESEARCH	DEVELOP- MENT	TEACHING/ TRAINING	RESEARCH MANAGEMENT/ ADMIN- ISTRATION	OTHER MANAGEMENT/ ADMIN- ISTRATION	REPORT TECHNICAL WRITING	CON- SULTING	COMPUTER APPLICA- TION	OTHER
Chemical Engineering	7.7	46.2	15.4	7.7	7.7	-	-	7.7	7.7
Electrical Engineering	33.3	20.0	20.0	6.7	-	6.7	-	13.3	-
Other Engineering and Applied Sciences	39.5	11.6	23.3	4.7	4.7	4.7	7.0	4.7	-

SOURCE: Statistics Canada, "Survey of 1976 Doctoral Degree Recipients
from Canadian Universities", 1979.

7.0 THE ISSUES

The Ontario post-secondary system is, in general, "polytechnic" in the wide scope of its program coverage and is heavily committed to career-oriented programs. Moreover, manpower supply and demand with respect to graduates of university degree and college post-secondary level programs, is largely in a state of equilibrium with some shortages in engineering, accounting and other business-related studies, computer-related programs and many trades. On the other hand, there is a surplus of supply both in some "theoretical" fields like the humanities and in some of the "career-oriented" programs in the colleges of applied arts and technology.

The present equilibrium in supply and demand is based upon current, low rates of economic growth prevailing in Canada and much of the industrialized world and Canada's low rate of investment in research and development. Needless to say, a dramatic shift in economic growth rates and investment in research and development would upset this equilibrium. Massive energy related projects in Western Canada may impose additional manpower demands as will technological changes.

While the Ontario post-secondary system in total appears to be thoroughly "polytechnic" in scope, we must ask whether the present, rigidly stratified system serves the province's needs as well as it might. There is an extensive overlap between the colleges and the universities. Many of the fields we studied are interdisciplinary in nature and fit the model of a continuum very well. There is, of course, a progressive development of learning in these fields, but can this learning be neatly categorized into two discrete levels? In this regard, it is interesting to note that Germany has developed comprehensive universities that embrace all levels of post-secondary study.

It is difficult to discern a distinct "middle level" of learning that must necessarily be filled by a middle or "polytechnic" stratum of post-secondary education. In many fields of study, there are multiple, overlapping levels of programming which are more continuous in nature. However, a middle stratum might well make possible more

combinations of theoretical and practical studies to overcome the apparent quantum leap between the "practical" and the "theoretical". Between the professions and paraprofessions and their preparatory educational programs, strengthened bridging mechanisms may be needed to allow those who demonstrate talent and initiative to move from the paraprofessional levels to the professional levels. As the educational clientele ages, will the demand for bridging, for moving upward in one's field, increase? With an aging labour force, will industry require more opportunities for employee retraining to facilitate productivity increases? These are important questions.

Accessibility has an important bearing on the polytechnic question as well. An important factor is the value which young people, families and peer groups place upon different kinds of education. At the present time, there is a much higher representation of lower socio-economic status families in the colleges than in the universities.¹ Does the perceived "practical" orientation of college programs appear more attractive to youth and their families in the lower socio-economic categories? Would social equality be increased if opportunities existed for youth to get a stronger grounding in theoretical studies while majoring in a "practical" program or, conversely, taking a "practical" minor as part of a specialized program in the humanities, social or natural sciences or mathematics? Would provision of those opportunities help to equalize success?

Within a few years, the base population of 18-24 year-olds, from which universities and colleges draw nearly 90% of their full-time undergraduate and post-secondary enrolment, will begin a steep decline. The impact will vary between the regions of the province. The question arises whether in certain regions, a closer co-ordination of programs in the colleges and the universities could not broaden and enrich the range of their offerings and offset enrolment declines.

¹P. Anisef et al., Is The Die Cast? (Toronto: Ministry of Colleges and Universities, 1980), p. xxiii.

Would such coordination strengthen the opportunities, in the regions and in the whole province, for combining more theoretical and practical studies? If so, the time to plan for such changes is now. On the other side of the coin, we note with concern the apparent increasing tendency in British Polytechnics and Ryerson to emphasize degree level studies. Critics of higher education in Germany have also noted a constant upward development of all institutions toward the university level.¹ There is a great danger that an expanded polytechnic stratum will cause resources to be shifted to degree programs at the expense of diploma programs that cater to skilled manpower needs.

Another important point is the fact that the Ontario colleges of applied arts and technology were developed as alternative training routes on a par with universities, not as subservient transfer institutions. They prepare people for specific careers as ends in themselves. To expand upon the "middle" or polytechnic level or even to develop extensive linkages between the colleges and universities could detract from the colleges as alternatives. Post-secondary education would be seen as a ladder with the colleges occupying the bottom rung, polytechnics the middle and universities the top. This development could have serious effects on the colleges and the careers for which they prepare people.

The development of action plans for Ontario depends upon the resolution of several basic questions, and on the input that will result from public discussion of the issues contained in this paper. The following questions among many must be addressed:

1. Are present systems sufficiently polytechnic in depth as well as scope? Can the current and potential manpower shortages be resolved by expanding capacity in those programs related to the fields in which the shortages now appear?

¹Dr. J. Fisher in Problems of Integrated Higher Education: An International Case Study of The Gesamthochschule, (Paris: International Association of Universities, 1972).

2. Would a separate stratum of post-secondary institutions, created by formally merging colleges and universities that have complementary theoretical/ practical strengths into polytechnical universities, provide the necessary opportunities to meet Ontario's manpower needs? If the polytechnic universities offered Bachelors' Degrees in applied arts and technology in addition to current offerings, would the present role of CAATs be undermined, or strengthened?
3. Would it be more appropriate to minimize disruption of the existing systems by establishing consultation and program coordination mechanisms between colleges and universities in fields where the nature of the studies is "applied" and continuous?
4. How should industry and professions interface with education in such areas as:
 - engineering and engineering technology;
 - computer science, programming and data processing;
 - business management and administrative studies;
 - various health disciplines;
 - fine and applied arts?
5. What are the financial implications if it should be necessary to accommodate the development of new structures and processes in polytechnic education?

PROGRAMS OFFERED AT ONTARIO'S UNIVERSITIES AND COLLEGES OF APPLIED ARTS AND TECHNOLOGY

IN THE SAME FIELD AS THOSE OFFERED AT THE POLYTECHNICS OF ENGLAND & WALES

PROGRAM	POLYTECHNICS OF ENGLAND & WALES			ONTARIO UNIVERSITIES ^{1,3}		ONTARIO COLLEGES		Duration of College Program (Years)
	DEGREE	H.N.D.	No. of Programs	No. of Programs	No. of Programs	No. of Programs		
SCIENCES AND APPLIED SCIENCES								
Astronomy	2	-	2	Astronomy	-			
Anthropology	1	-	12	Anthropology	-			
Biochemistry	8	-	11	Biochemistry	-			
Biochemical Engineering	1	1	1	Biochemical Engineering	1	Chem. (Biochemical TN + TY) ²	2 + 3	
Biology/Biosciences	22	10	15	Biology	1	Biol. Science	3	
Biomolecular Science	2	-						
Chemistry	27	13	15	Chemistry	1	Chem. (Biochemical) TN	2	
					3	Chemical TY	3	
					8	Chemical Engineering TN	2	
					14	Chemical Engineering TY	3	
					1	Chemical (Environmental) Eng. TY	3	
					1	Chemical (Food & Drug) TY	3	
					2+2	Chemical (Industrial) Eng. TN + TY	2 + 3	
					1	Chemical (Industrial Hygiene) Eng. TY	3	
					2	Chemical (Laboratory) TN	2	
					1	Chemical (Microbiology) TY	3	

PROGRAM POLYTECHNICS OF ENGLAND & WALES
DEGREE H.N.D.

ONTARIO UNIVERSITIES

No. of
Programs

No. of
Programs

Computer Science/Studies

23

22

12 Computer Sciences

ONTARIO COLLEGES

No. of Programs	Duration of College Program (Years)
1 Chemical (Nuclear) TY	3
1 Chemical (Pharmaceutical) TY	3
1+1 Chemical (Polymer) Eng. TN + TY	2 + 3
2+2 Chemical Eng. TN + TY	2 + 3
1 Computer (Computing Sci.) TY	3
1 Computer (Data Processing) TN	2
3 Electronic Data Processing	Short Program
1+1 Electronics (Computer) Eng. TN+TY	2 + 3
1 Electronics (Computer System) Eng. TY	3
1+1 Computer Eng. TN + TY	2 + 3
2+1 Computer Ops. & Anal./Data Processing	3 + 2
2 Computer (Science) TY	3
4 Computer Systems Analysis	3
1 Computer Ops. & Anal./Data Processing	3
2 Computer Programmer, Operator	2-3
1 Control (Computer Sys.) Eng. TY	3
1 Electronics (Computer Sys.) Eng. TY	3
1 Control (Computer Sys.) Eng. TY	3

POLYTECHNICS OF ENGLAND & WALES		ONTARIO UNIVERSITIES		ONTARIO COLLEGES	
PROGRAM	DEGREE	No. of Programs	No. of Programs	No. of Programs	Duration of College Program (Years)
Cosmetics Science/Tech.		1	1	1 Cosmetic Retail Mgt./Sales	2
				3 Hairdressing	Short Program
				10 Hairdressing/Hairstylist	1
Environmental Sc./Biology		13	(See Environmental Studies)	1 Resources (Environmental) Eng. TY	3
				2 Forestry (Fish & Wild Life) TY	3
Fishery Science		1	1 Marine Biology	1 Chemical (Food & Drug) TN	2
				Food (Laboratory) TN	2
Food & Dietetics		4	3 Dietetics	12 Food Preparation	Short Program
			4 Nutrition	1 Food (Processing) Eng. TY	3
			3 Home Economics	1 Food (Science) TY	3
			1 Food Science	1 Food Service & Hospitality	Short Program
				6 Food Service Management	2
				1 Food Service Management TN	2
General Science		8	15 General Science	16 General Arts & Science	2 - 3
				3+2 Geol. Eng. TN + TY	2 + 3
Geology/Geophysics		11	11 Geology	1 Geophysical Assistant	Short Program
				2 Information Processing	1 1/2 - 2
Information Systems		2	4 Geol. & App. Earth Scs.		
			1 Information & Systems Science		

PROGRAM POLYTECHNICS OF ENGLAND & WALES
DEGREE H.N.D.

ONTARIO UNIVERSITIES

ONTARIO COLLEGES

	No. of Programs	No. of Programs	No. of Programs	No. of Programs	Duration of College Program (Years)
Maritime Nautical Studies	3	1		1 Marine Civil Eng. TY 2 Marine Engineer 2 Marine Engineering TY 1 Marine (Navigation) TY 2 Marine Navigator 1 Marine Small Pleasure Craft 8 Marine & Small Powered Equipment Mechanic 1 Marine (Underwater Skills) Technique 3 Marine & Small Vehicle Maintenance	3 Short Program 3 3 Short Program Short Program Short Program Short Program Short Program Short Program
Materials/Polymer Sci.	9	1	4	Materials Science	
Mathematics	20	-	16	Mathematics	
Maths. Stats. & Computing	14	14	9	Mathematics, Statistics and Probability & Statistics	
Medical Technology & Science	2	2	2	Medical Science (Master Level only)	1 Electronics (Biomedical) Eng. TY 1 Electronics (Medical Eqt.) Eng. TN 1 Biomedical Electronics Eng. TY

PROGRAM

ONTARIO UNIVERSITIES

ONTARIO COLLEGES

	No. of Programs	No. of Programs	No. of Programs	Duration of College Program (Years)
Occupational Hygiene	1	-	1 Biomedical Eqpt. TN/Maintenance	1
Pharmacology	4	-	11 Medical Laboratory TY + TN	3 + 2
Pharmacy	5	-	Medical (Prosthetic Aids-Hearing Tech.)	1
			4 Radiography	2-3
Photographic Sciences	1	-	1 Chem. (Pharmaceutical) TY	3
			3 Pharm. Assistant	1
Physics/Physical Electron.	18	-	1 Photocomposition & Paste up	Short Program
			4 Photographic Arts	2-3
			1 (Photographic) Science TN	2
			(See Electronics TN + TY)	
			1 Atmospheric Physics	
			1 Aerospace Physics	
			4 Biophysics	
			6 Chem. Physics	
			1 Applied Nuclear Physics	
			4 Geophy. Space Physics, Astrophysics	

<u>PROGRAM</u>	<u>POLYTECHNICS OF ENGLAND & WALES</u>		<u>ONTARIO UNIVERSITIES</u>		<u>ONTARIO COLLEGES</u>	
	<u>DEGREE</u>	<u>H.N.D.</u>	<u>No. of Programs</u>	<u>No. of Programs</u>	<u>No. of Programs</u>	<u>Duration of College Program (Years)</u>
Physical Science	10	-		8 Math. Physics 5 Engineering Physics 15 Physics (See Math., Physics & Chemistry)		
	7	1		1 Biological Physiology 4 Biological Physiology & Medical Physiology		
	13	-		7 Statistics		

PROGRAM	POLYTECHNICS OF ENGLAND & WALES		ONTARIO UNIVERSITIES		ONTARIO COLLEGES	
	DEGREE	H.N.D.	No. of Programs	No. of Programs	No. of Programs	Duration of College Program (Years)
Ceramic Technology	1	-	1 Ceramic Engineering			
	1	3	2 Food Science 2 Dietetics/Diététique 5 Nutrition (English Language 5, French Language 1) 1 Food Administration	1 Food (Laboratory) TN 1 Food Preparation 1 Food (Processing) Eng. TY 1 Food (Science) TY 1 Baker 4 Cook	2 Short Program 3 3 1½ 1-1½	
Food Technology						
Fuel Technology	1	3				
	4	4	3 Metallurgy 4 Metallurgical Engineering	2-2 Metallurgical Eng. TY + TN	3 + 2	
Metallurgy						
Polymer/Materials	7	3	4 Materials Science, Handling, Engineering	1 Chem. (Polymer) Eng. TY + TN	3 + 2	
Printing	-	1	-			
Textiles	2	2	2 (Clothing, Textiles, Design and Fashion)	1 Textile Eng. TY 1 Textile Fabric/Floor Covering (Mktg.)	3 1	

PROGRAM	POLYTECHNICS OF ENGLAND & WALES		ONTARIO UNIVERSITIES		ONTARIO COLLEGES	
	DEGREE	H.N.D.	No. of Programs	No. of Programs	No. of Programs	Duration of College Program (Years)
Architectural	16	-	3	ENVIRONMENTAL STUDIES:		
				1 Architectural (Build.) TN	2	2
Building/Construction	10	13		2+2 Architectural (Design) TN + TY	2 + 3	2 + 3
				3 Architectural (Drafting) TN	2	2
				1 Architectural (Mechanical Systems) TN	2	2
				5+6 Architectural TN + TY	2 + 3	2 + 3
				1 Construction (Civil) Eng. TN	2	2
				5+3 Construction Eng. TN + TY	2 + 3	2 + 3
Environmental Studies	8	-	6	1 Construction (Heavy Eqpt.) Eng. TN	2	2
				1 Construction Management (Residential) TN	2	2
				1+1 Construction (Management) Eng. TN + TY	2+3	2+3
				1 Construction (Supervisor) Eng. TN	2	2
				Construction Trades		
				(25 Related Short Programs)	Short Program	
Environmental Studies	8	-	6	1 Resources (Environmental) Eng. TY	3	3
				1 Urban Design	3	3
				1 Environmental Art	3	3
				1 Environmental Horticultural	Short Program	
				Environmental Planning/Community/Development	2	2

POLYTECHNICS OF ENGLAND & WALES

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H.N.D.

ONTARIO UNIVERSITIES

ONTARIO COLLEGES

PROGRAM	No. of Programs	No. of Programs	No. of Programs	No. of Programs	No. of Programs	Duration of College Program (Years)
Estate Management	14	3	-	-	4 Public Assessment/Real Property Appraisal/Administration 5 Property Management/Real Estate/Insurance/Standards	2 2 - 3
Geography	21	-	15	Geography		
Landscape Architecture	3	-	2	Landscape Architecture	3 Landscape Design 1+1 Landscape TN + TY	1 1/2 - 3 2 + 3
Planning/Housing Studies	11	-	4	Community, Urban, Regional Planning		
Surveying: Quantity	12	2				
Surveying: Building, Land	7	3	1	Survey Science	1 Survey (Aerial) TN 3 Survey Assistant 1 Survey (Hydrographic) TY 2+1 Civil (Surveying) Eng. TN+TY 1+1 Survey (Land) TN + TY 8+4 Survey TN + TY	2 Short Program 3 2 + 3 2 + 3 2 + 3

POLYTECHNICS OF ENGLAND & WALES

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ONTARIO UNIVERSITIES

ONTARIO COLLEGES

Duration of
College Program
(Years)

No. of
Programs

No. of
Programs

No. of
Programs

No. of
Programs

ARTS AND HUMANITIES

Arabic 1 - 1 Arabic Language & Literature

Chinese 1 - 1 Chinese/Chinese Studies

Italian 2 - 10 Italian Language & Literature

Classics/Classical
Civilization 1 - 13 Classics, Classical Studies

English/Literary Studies 20 - 16 English Language & Literature

French Studies 21 1 16 French Language & Literature

German Studies 20 1 14 German Language & Literature

History/Historical Studies 25 - 16 History Language & Literature
4 Ancient History, Civilization

History of Arts & Design 9 - 10 Art History

Humanities/Modern Studies 20 -

Linguistics 1 - 8 Linguistics, Applied Ling.

Modern European Studies 9 -

Music 8 - 14 Music

6 Music Education

9 Music History, Literature

9 Music Performance, App. Music

3 Music

1 Music Industry Arts

3 Music

3 Music

<u>PROGRAM</u>	<u>POLYTECHNICS OF ENGLAND & WALES</u>		<u>ONTARIO UNIVERSITIES</u>		<u>ONTARIO COLLEGES</u>	
	<u>DEGREE</u>	<u>H.N.D.</u>	<u>No. of Programs</u>	<u>No. of Programs</u>	<u>No. of Programs</u>	<u>Duration of College Program (Years)</u>
Performance/Movement Studies	6	-	9 Music Theory, Composition 4 Musicology	3 Music	3	
Philosophy	9	-	4 Kinesiology 15 Philosophy			
Religious Studies	3	-	12 Religion, Religious Studies 4 Theology, Theological Studies			
Photographic Arts	1	-	2 Photography	4 Photographic Arts 1 Science (Photographic) TN 1 Photo Composition & Paste up	2 ~ 3 2 Short Program	1 11 1
Russian Studies	6	-	7 Soviet, Russian Studies			
Spanish, Latin American Studies	12	-	14 Spanish Language & Lit. 4 Latin American, Caribbean Studies			

POLYTECHNICS OF ENGLAND & WALES
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PROGRAM

ONTARIO UNIVERSITIES

ONTARIO COLLEGES

	No. of Programs	No. of Programs	No. of Programs	No. of Programs	Duration of College Program (Years)
Aeronautical	3	2	1 Aerospace Engineering	3 Aviation (Aircraft Mtce.) TN	2
			1 Aeronautical Engineering (Graduate only)	3 Aviation (Avionics Mtce.) TN	2
				2 Aviation (Flight) TY	3
				1 Aviation (Management)	2
				1 Aviation Pilots Rotary Wing	1
				1 Aviation (Trans. & Indus.) Eng. TY	3
				1 Aircraft Mtce. TN (short course)	Short Program
				1 Avionics (Short course)	Short Program
				2 Electronics (Avionics) TN	2
Chemical	5	4	10 Chemical Engineering	8+14 Chemical Engin. TN + TY	2 + 3
			1 Chemical Engineering Technology (Lakehead)	2+2 Chemical (Indust.) Engin. TN + TY	2 + 3
			2 Chemical Engin. (Nuclear Option)		
Civil/Structural	18	15	10 Civil Engineering		
			1 Civil Engineering Technology (Lakehead)	1 Civil (Bldg. Constn.) TN	2
				2 Civil (Const.) Engin. TN	2
				1 Construction (Civil) Engin. TN	2
				1 Civil (Drafting) Engin. TN	2
				11+15 Civil Engineering TN + TY	2 + 3

PROGRAM

ONTARIO COLLEGES

	No. of Programs	No. of Programs	No. of Programs	Duration of College Program (Years)
Communications	3	-	1 Civil (Explosives) Engin. TN	2
			1 Civil (Marine) Engin. TY	3
			1 Civil (Municipal) Engin. TY	3
			1+1 Civil (Pub. Works) Engin. TN + TY	2 + 3
			1 Civil (Restoration) Engin. TY	3
			2+1 Civil (Surveying) Engin. TN + TY	2 + 3
			1 Civil (Trans.) Engin. TY	3
			2 Electronics (Comm.) Engin. TN	2
Computer Technology	2	-	1 Computer (Computing Sc.) TY	3
		12 Computer Science	1 Computer (Data Proc.) TN	2
		2 Computer Engineering	1+1 Electronics (Computer) Engin. TN + TY	2 + 3
			1+1 Computer Engineering TN + TY	2 + 3
			1+1 Computer (Science) TY	3
			1 Computer (Systems) TY	3
Control & Instrumentation	7	5	1 Control (Computer Systems) Engin. TY	3
Electrical	22	23	1 Electrical (Control) Engin. TN	2
			2 Electrical (Cont. Syst.) Engin. TN	2
			1 Electrical (Design) Engin. TN	2

<u>PROGRAM</u>	<u>POLYTECHNICS OF ENGLAND & WALES</u>		<u>ONTARIO UNIVERSITIES</u>		<u>ONTARIO COLLEGES</u>	
	<u>DEGREE</u>	<u>H.N.D.</u>	<u>No. of Programs</u>	<u>No. of Programs</u>	<u>No. of Programs</u>	<u>Duration of College Program (Years)</u>
Electronics	22	23	1	1 Electronics Engineering Technology (Lakehead) 1 Electronics (Acoustics) Engin. TN 1 Electronics (Biomedical) Engin. TY 2 Electronics (Comm.) Engin. TN 1+1 Electronics (Computer) Engin. TN + TY 1 Electronics (Computer Syst.) Engin. TY 1 Electronics (Control Syst.) Engin. TY 20+18 Electronics Engin. TN + TY 1 Electronics (Med. Eqpt.) Engin. TN	1 Electrical Drafting 1 Electrical (Elec. Pwr.) Engin. TY 11+6 Electrical Engineering TN + TY 1 Electrical (Pwr. Cont. Syst.) Engin. TY 4 Electrical (Power) Engin. TY 1 Electrical (Pwr. Syst.) Engin. TN 1 Electro-Mechanical (Cyb.) Engin. TY 3+1 Electro-Mechanical Engin. TN + TY 1 Electro-Mechanical (Precision Instruments) Engineering TN	Short Program 3 2 + 3 3 3 2 3 2 + 3 2

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DEGREE H.N.D.

PROGRAM

ONTARIO UNIVERSITIES

ONTARIO COLLEGES

	No. of Programs	No. of Programs	No. of Programs	No. of Programs	Duration of College Program (Years)
Engineering Science	2	-	2	Engineering Science	3
Environmental	2	-	1	Electronics (Nuclear Power & Control) Engineering TY	3
Illumination/Vehicle	1/1	-	10	Electronics (Pwr. Cont.) Engin. TY	3
Mechanical	26	26	1	Electronics (Telecomm.) Engin. TY	3
			1	Electronics (T.V./Audio) Engin. TN	2
			1	Electronics (Video) Engin. TY	3
			1	Resources (Environ.) Engin. TY	3
			1	Motive Power Engin. TY	3
			1	Mechanical (Applied Machine Shop) Engineering TN	2
			1	Mechanical (Bldg. Serv. Drafting) Engineering TN	2
			3+1	Mechanical (Design) Engin. TN + TY	2 + 3
			1	Mechanical Drafting (Design) Engin. TN	2
			1	Mechanical Drafting (Design) Engin. TN	2
			9	Mechanical Engineering TN	2
			2	Mechanical (Hydraulic & Pneum.) Engineering TN	2

POLYTECHNICS OF ENGLAND & WALES
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ONTARIO COLLEGES

ONTARIO UNIVERSITIES

PROGRAM

PROGRAM	POLYTECHNICS OF ENGLAND & WALES DEGREE H.N.D.		ONTARIO COLLEGES		Duration of College Program (Years)
	No. of Programs	No. of Programs	No. of Programs		
Mining	1	3	2	Mining Engineering TN + TY	2 + 3
Naval Architecture	2	1	1	Civil (Marine) Engin. TY	3
			2	Marine Engineering TY	3
Production/Industrial	15	15	2	Industrial Engineering	2 + 3
			1	Industrial (Fire Prev.) Engin. TN	2
			1	Industrial (Lab.) Engin. TY	3
			3	Industrial (Management) Engin. TY	3
			1	Industrial (Quality Cont.) Engin. TN	2
			2	Industrial (Safety) Engin. TN	2
			1	Industrial (Tech. Sales) Engin. TY	3
			1+1	Mechanical (Indus.) Engin. TN + TY	2 + 3
			1+1	Mechanical (Mfg.) Engin. TN + TY	2 + 3
			1	Mechanical (Mobile Eqpt.) Engin. TY	3
			1	Mechanical (Nuclear) Engin. TY	3
			1	Mechanical (Nuclear Control) Engineering TN	2
			3	Mechanical (Tool & Die) Engin. TN	2
			2	Mechanical (Toolmaking) Engin. TN	2
			14	Mechanical Engineering TY	3
			2+2	Mining Engineering TN + TY	2 + 3
			1	Civil (Marine) Engin. TY	3
			2	Marine Engineering TY	3
			2+1	Industrial Engineering TN + TY	2 + 3
			1	Industrial (Fire Prev.) Engin. TN	2
			1	Industrial (Lab.) Engin. TY	3
			3	Industrial (Management) Engin. TY	3
			1	Industrial (Quality Cont.) Engin. TN	2
			2	Industrial (Safety) Engin. TN	2
			1	Industrial (Tech. Sales) Engin. TY	3

PROGRAM	POLYTECHNICS OF ENGLAND & WALES	ONTARIO UNIVERSITIES	ONTARIO COLLEGES
	DEGREE	H.N.D.	
No. of Programs	No. of Programs	No. of Programs	No. of Programs
			Duration of College Program (Years)
Accountancy/Finance	25	7 Accounting/Accountancy 6 Finance	25 Accounting 3 Accountancy 17 Accounting Clerk
Business Studies	29	10 Business/Business Admin. 7 Administration, Admin. Studies 6 Management, Management Sciences Business Management 3 Industrial, Labour Relations 8 Public Administration	24 Business Administration 7 Business & Commercial/ Business Machines & Bookkeeping 19 Business, General 1 International Business 4 Business Machines 2 Business, Management of Farms 3 Business/Marina/Recreation Vehicles/ Motor Career Administration
Communications/Media Studies	5	4 Communication Arts, Communications 2 Journalism	1 Applied Communications 3 Communications Arts

POLYTECHNICS OF ENGLAND & WALES
DEGREE H.N.D.

ONTARIO UNIVERSITIES

ONTARIO COLLEGES

PROGRAM	No. of Programs	No. of Programs	No. of Programs	Duration of College Program (Years)
Education	22	12	11 Education	1 Audio Visual Communications 2 2 Electronic Communications Short Program 2 Electronic (Communications) Eng. TN 2 3 Graphic Communications 2 - 3 1 Communications (Studio Techniques) 2 - 3
Cert. Education				21 Early Childhood Education/Day Worker 2 - 3
Hotel Catering & Institutional Mgt.	4	9	1 Hotel Administration	11 Tourism/Travel/Transportation 1 - 3 1 Tourist Outfitting & Guiding Short Program 1+1 Hotel Front Officer Operation/ Reception Short Program 10 Hotel/Hotel/Restaurant Management 2 - 3 Ops.
Economics	25	1	16 Economics	
International Relations	2	-	5 International Affairs, Relations	
Law	22	1	7 Law	14 Law & Security Administration 1 - 2 10 Legal/Office Admin./Assistant 1 - 3
Librarianship/Information Studies	7	-	1 Library Science (Lakehead Diploma) (2 Graduate only)	6 Library TN 2

PROGRAM

POLYTECHNICS OF ENGLAND & WALES

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ONTARIO UNIVERSITIES

ONTARIO COLLEGES

	No. of Programs	No. of Programs	No. of Programs	No. of Programs	Duration of College Program (Years)
Marketing	15	5	7 Marketing	24 Marketing	2 - 3
Nursing	2	-	8 Nursing	8 Marketing Retail	2 - 3
Speech Therapy	3	-	1 Speech Pathology & Audiology (1 Graduate only)	3 Nursing Assistant	1
Operational Research			1 Operations Research	9 Nursing Assistant Post RNA	Short Program
Personnel Admin.	3	-	2 Industrial Relations	26 Nursing Diploma	2
Politics	21	-	2 Labour Relations	11 Nursing Post RN	Short Program
Psychology	13	-	16 Political Science, Politics	13 Nursing Refresher	Short Program
Public/Social Admin.	14	5	16 Psychology		
			8 Public Administration		
			6 Admin./Administrative Studies		
				4 Personnel Admin./Labour Relations	2 - 3
				4 Public Administration/Municipal Government Services	1 - 2

PROGRAM

POLYTECHNICS OF ENGLAND & WALES
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ONTARIO UNIVERSITIES

ONTARIO COLLEGES

	<u>No. of Programs</u>	<u>No. of Programs</u>	<u>No. of Programs</u>	<u>Duration of College Program (Years)</u>
Social Studies/Social Science	22	-	Numerous Disciplines, e.g. Anthropology, Business, Commerce, Economics, History, Political Science, Physical Education & Recreation, Sociology, Psychology, Social Work and others	
Sociology	22	-	16 Sociology	
Transport	2	1	1 Transportation Planning TY 1 Transportation Planning TY 11 Transportation/Tourism/Travel 1 Civil (Transportation) Eng. TY	2 3 1 - 3 3

PROGRAM	POLYTECHNICS OF ENGLAND & WALES			ONTARIO UNIVERSITIES			ONTARIO COLLEGES		
	DECREE	H.N.D.	No. of Programs	No. of Programs	No. of Programs	ART & DESIGN	No. of Programs	Duration of College Program (Years)	
Fine Art	19	-		1 Art Conservation (Graduate only) 3 Art Education 10 Art, Fine Arts 10 Art History 3 Dance 12 Drama, Dramatic Art 7 Film, Cinema 3 Painting 9 Studio Art			1 Art Conservation Techniques 3 Visual Arts Instructor 3 Commercial Art & Design/Packaging Design 6 Crafts & Design/Material Arts/Furniture Accessory 6 Creative Arts/Crafts/Book Binding/Art Resources/Ceramics 7 Design Arts/Basic Design 1 Environmental Art 9 Fine Arts & Crafts/Administration 3 Metal Arts 2 Painting 1 Pottery 4 Sign Writing (Commercial) (Screen Printing) Printing	2 2 - 3 2 - 3 2 - 3 1 - 3 1 - 3 3 1 - 3 3 3 2 - 3 1 - 3	
	14	-		1 Graphics (Graduate only)			10 Graphic Design 4 Industrial Design 8 Interior Design/Decorating	2 - 3 2 - 3 2 - 3	

POLYTECHNICS OF ENGLAND & WALES

DEGREE H.N.D.

ONTARIO UNIVERSITIES

ONTARIO COLLEGES

PROGRAM

No. of Programs

No. of Programs

No. of Programs

Duration of College Program (Years)

3 - D Design

Ceramics

Furniture

Industrial Design (Engineering)

Industrial Design (Transportation)

Interior Design

Jewellery

Silver/Metal

Silver Smithing

Theatre

1 Ceramic Engineering

1 Industrial Design (Architectural)

6 Theatre, Theatre Arts

6 Creative Arts/Crafts/Book Binding/ Art Resources/Ceramics

6 Furniture Accessory/Crafts & Design/ Material Arts

1 Furniture (Renovation) TN

3 Furniture Upholstery & Manufacturing

3 Furniture Upholstery & Repair

2 Furniture Woodworking & Finishing

4 Industrial Design

4 Industrial Design

8 Interior Design & Decorating

2 Jewellery Arts/Repairs

2 Metal Arts

2 Metal Arts

2 Metal Fabrication

4 Theatre Arts/Performing Arts

POLYTECHNICS OF ENGLAND & WALES
DEGREE H.N.D.

ONTARIO COLLEGES

No. of Programs	No. of Programs	Duration of College Program (Years)
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1	Wood Products Management	3
1	Manufacturing (Wood Products) TN	2
2	Furniture Woodworking & Finishing	Short Program
2	Metal Arts (1 Ironworker)	3
2	Metal Fabrication (6 Sheet Metal Worker)	Short Program

1	Textile Eng. TY	3
1	Textile Fabric/Floor Covering	1

9	Fashion Arts/Modelling/Design/Merchandising	2 - 3
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9	Fashion Arts/Modelling/Design/Merchandising	2 - 3
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9	Fashion Arts/Modelling/Design/Merchandising	2 - 3
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9	Fashion Arts/Modelling/Design/Merchandising	2 - 3
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ONTARIO UNIVERSITIES

No. of Programs	No. of Programs
-----------------	-----------------

1	-
---	---

3	-
---	---

2	Clothing & Textiles, Design Fashion
---	-------------------------------------

9	Admin. Administrative Studies
---	-------------------------------

1	-
---	---

1	-
---	---

2	-
---	---

10	-
----	---

1	-
---	---

PROGRAM

Wood/Metal/Ceramics

Wood/Metal/Plastics

Textiles/Fashion

Admin./Business Studies

Couture - Fashion

Embroidery

Fashion

Footwear Design

POLYTECHNICS OF ENGLAND & WALES

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PROGRAM

No. of Programs	No. of Programs
Knitwear Design	1
Textile Design	2
Woven & Printed Textiles	5
Inter-Area Graphic & 3D Design	1

ONTARIO UNIVERSITIES

No. of Programs

9 Fashion Arts/Modelling/Design/Merchandising	2 - 3
9 Fashion Arts/Modelling/Design/Merchandising	2 - 3
9 Fashion Arts/Modelling/Design/Merchandising	2 - 3
10 Graphic Design	2 - 3
4 Industrial Design	3
8 Interior Design	2 - 3

ONTARIO COLLEGES

No. of Programs Duration of College Program (Years)

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ONTARIO COLLEGES

Duration of
College Program
(Years)

No. of
Programs

No. of
Programs

No. of
Programs

No. of
Programs

INTERDISCIPLINARY COURSES

(In Ontario Universities there are considerable opportunities for interdisciplinary studies. An inventory of such programs is beyond the scope of this study.)

Combined Studies

10

-

Computing & Business
Studies/Economics

5

-

Education & Science

3

-

Education & Bus. Studies

1

-

Engineering & Business/
Other Studies

3

-

Geography & History/
Economics

8

-

Industrial Studies

1

-

Languages, Economics &
Politics

9

2

Librarianship with Modern
Languages

1

-

Science & Business/Other
Studies

11

-

Society & Technology

2

-

Modular Degree

14

-

Dip. Higher Education

-

11

Sources: 1. A. Wilkinson, A Comparison of Polytechnic Education in England and Wales with Polytechnic Education in Ontario, (Toronto: Ministry of Colleges and Universities, February, 1980).

2. Association of Colleges and Universities of Canada, Directory of Canadian Universities, 1979.

3. Ministry of Colleges and Universities, Horizons, 1980-81.

1. Includes Royal Military College but not Ryerson Polytechnical Institute.

2. TN=Technician, TY=Technology

3. Programs listed are undergraduate unless otherwise noted.

UNEMPLOYMENT RATE
1978-79 GRADUATES
COLLEGES OF APPLIED ARTS AND TECHNOLOGY
ENGLISH LANGUAGE PROGRAMS

Appendix B

Graduates Seeking Employment as a Percentage of Graduates Available for Work

DIVISION: APPLIED ARTS		Duration (Years)	Number Available For Work	No. Still Seeking Work as at 15 Nov. 1979	%
PROGRAM NAME					
Addiction Counsellor		2	9	3	33.3
Advertising	Fr. ¹	2	36	3	8.3
Advertising		3	15	5	33.3
Animation		3	17	2	11.8
Art Conservation Techniques		3	4	1	25.0
Behavioural Science		3	11	2	18.2
Behavioural Science Technician		2	30	5	16.7
Book Editing & Design		2	3	0	0.0
Bookbinding		1	2	0	0.0
Broadcasting-Radio & TV	Fr.	2	106	10	9.4
Broadcasting-Radio & TV		3	48	3	6.3
Canadian Nanny		2	11	3	27.3
Ceramics		3	2	0	0.0
Chef Training		1	17	2	11.8
Child Care Worker	Fr.	2	95	7	7.4
Child Care Worker		3	72	8	11.1
Cinematography		3	16	3	18.8
Commercial Art	Fr.	2	95	3	3.2
Commercial Art		3	92	9	9.8
Communication Arts		2	64	16	25.0
Community Planning		2	25	7	28.0
Community Services		2	16	5	31.3
Consumer & Family Studies		2	16	1	6.3
Correctional Worker		2	31	3	9.7
Crafts & Design		2	2	0	0.0
Crafts & Design		3	25	3	12.0
Creative Art	Fr.	2	7	1	14.3
Creative Art		3	3	1	33.3
Early Childhood Ed-Handicapped		3	34	2	5.9
Early Childhood Education	Fr.	2	508	34	6.7
Equitation	Fr.	1	7	1	14.3
Family Day Care		1	1	0	0.0
Fashion Arts	Fr.	2	100	19	19.0

DIVISION: APPLIED ARTS		Duration (Years)	Number Available For Work	No. Still Seeking Work as at 15 Nov. 1979	%
PROGRAM NAME					
Fashion Arts		3	36	5	13.9
Fashion Modelling		1	39	9	23.1
Film Production		2	3	0	0.0
Film Production		3	7	0	0.0
Fine Art		2	0	0	N.A.
Fine Art		3	14	1	7.1
Fitness Instructor		2	16	0	0.0
Floriculture-Retail		2	17	1	5.9
General Arts & Science	Fr.	2	47	13	27.7
General Arts & Science		3	9	2	22.2
Graphic Arts		1	2	0	0.0
Graphic Arts		2	26	0	0.0
Graphic Arts		3	27	0	0.0
Gymnastics Coach		2	11	0	0.0
Historical & Natural Interpret'n		2	11	1	9.1
Home Economics		2	13	3	23.1
Horsemanship		2	1	0	0.0
Horticultural Technician		2	34	0	0.0
Human Relations		2	14	3	21.4
Industrial Book Publishing		3	3	1	33.3
Instructional Technician		2	4	2	50.0
Interior Design		2	38	3	7.9
Interior Design	Fr.	3	74	10	13.5
Interior Design-Furniture		3	3	0	0.0
Jewellery Arts		2	5	0	0.0
Jewellery Arts		3	12	1	8.3
Journalism	Fr.	2	75	10	13.3
Journalism		3	39	3	7.7
Landscape Design		3	17	2	11.8
Landscape Technician	Fr.	2	24	1	4.2
Law & Security		1	15	0	0.0
Law & Security Administration	Fr. 2	2	324	41	12.7
Library Technician	Fr.	2	90	11	12.2
Material Arts-Textiles & Weaving		3	3	0	0.0
Mental Retardation Counsellor	Fr. 2	2	337	27	8.0
Mental Retardation-Dev Care		1	15	4	26.7

DIVISION: APPLIED ARTS		Duration (Years)	Number Available For Work	No. Still Seeking Work as at 15 Nov. 1979	
PROGRAM NAME					%
Music		3	11	1	9.1
Painting		1	16	6	37.5
Parks Operation & Services		2	23	0	0.0
Photographic Arts	Fr.	2	58	10	17.2
Photographic Arts		3	25	2	8.0
Public Relations		2	6	0	0.0
Public Relations		3	20	3	15.0
Recorded Music Production		3	4	0	0.0
Recreation Administration	Fr.	3	8	3	37.5
Recreation Leadership	Fr.	2	241	44	18.3
Social Research Technician		2	8	1	12.5
Social Service Worker	Fr.	2	185	33	17.8
Theatre Arts		2	12	2	16.7
Theatre Arts		3	4	0	0.0
Transportation Planning		2	3	1	33.3
Urban Design		3	8	4	50.0
Workshop Rehabilitation		2	22	3	13.6
TOTAL 1-YEAR PROGRAMS		1	114	22	19.3
TOTAL 2-YEAR PROGRAMS		2	2,802	330	11.8
TOTAL 3-YEAR PROGRAMS		3	663	77	11.6
DIVISION TOTAL			3,579	429	12.0

DIVISION: BUSINESS		Duration (Years)	Number Available For Work	No. Still Seeking Work as at 15 Nov. 1979		%
PROGRAM NAME						
Accounting	Fr.	2	314	45	14.3	
Accounting	Fr.	3	113	14	12.4	
Apparel Management		2	11	0	0.0	
Arena Management		3	17	1	5.9	
Assessment Administration		2	28	1	3.6	
Aviation Management		2	12	0	0.0	
Business		1	13	0	0.0	
Business	Fr.	2	195	20	10.3	
Business Administration	Fr.	3	321	22	6.9	
Business-Quantitative Methods		2	3	1	33.3	
Clerk Stenographer		1	76	16	21.1	
Computer Programmer		1	3	0	0.0	
Computer Programmer		2	48	1	2.1	
Computer Programmer/Analyst		3	33	1	3.0	
Cosmetic Sales		1	14	0	0.0	
Court Reporter		1	15	2	13.3	
Data Processing		1	13	1	7.7	
Data Processing		2	151	9	6.0	
Data Processing	Fr.	3	103	2	1.9	
Dicta Typist		1	76	17	22.4	
Farm Management		2	40	1	2.5	
Fashion Sales		3	18	0	0.0	
Finance		2	17	2	11.8	
Finance		3	79	1	1.3	
Food Service Management		2	58	1	1.7	
Food Service Management		3	4	0	0.0	
Hotel & Restaurant Admin		2	89	10	11.2	
Hotel & Restaurant Admin		3	43	0	0.0	
Industrial Management		3	37	0	0.0	
Industrial Relations		3	5	1	20.0	
Institute Management		2	2	1	50.0	
Insurance General		2	20	0	0.0	
Law Clerk		1	6	1	16.7	
Legal Office Administration		2	140	14	10.0	
Legal Office Administration		3	9	2	22.2	

DIVISION: BUSINESS		Duration (Years)	Number Available For Work	No. Still Seeking Work as at 15 Nov. 1979	%
PROGRAM NAME					
Manufacturing Management		3	2	1	50.0
Marketing Fr.		2	202	21	10.4
Marketing Fr.		3	136	12	8.8
Materials Management		3	11	0	0.0
Motor Carrier Administration		2	3	1	33.3
Municipal Administration		2	13	3	23.1
Parts Mgmt & Merchandising		1	11	0	0.0
Personnel Administration		2	12	1	8.3
Personnel Administration		3	14	3	21.4
Real Estate		2	17	2	11.8
Recreational Vehicles Mgmt		2	5	1	20.0
Residential Constr. Management		2	7	0	0.0
Retail Sales		1	9	0	0.0
Sales-Cosmetics		2	14	0	0.0
Sales-Fashion		2	24	1	4.2
Sales-Retail		2	70	4	5.7
Secretarial Arts-General		2	439	47	10.7
Secretarial Arts-Legal		2	442	22	5.0
Secretarial Arts-Medical		2	227	26	11.5
Secretarial Science-General		3	7	0	0.0
Secretarial-General		1	290	34	11.7
Secretarial-Legal		1	116	7	6.0
Secretarial-Medical		1	129	28	21.7
Secretarial-Optometrical		1	12	0	0.0
Ski Area Operation		3	16	4	25.0
Travel & Tourism		2	188	21	11.2
Travel & Tourism		3	78	4	5.1
Travel Counsellor		1	83	10	12.0
Urban Transit		2	1	0	0.0
TOTAL 1-YEAR PROGRAMS		1	866	116	13.4
TOTAL 2-YEAR PROGRAMS		2	2,792	256	9.2
TOTAL 3-YEAR PROGRAMS		3	1,046	68	6.5
DIVISION TOTAL			4,704	440	9.4

DIVISION: HEALTH		Duration (Years)	Number Available For Work	No. Still Seeking Work as at 15 Nov. 1979	%
PROGRAM NAME					
Ambulance & Emergency Care		1	134	20	14.9
Animal Care		1	36	9	25.0
Animal Care		2	32	6	18.8
Animal Care		3	28	6	21.4
Dental Assistant Fr.		1	238	14	5.9
Dental Hygiene		2	171	7	4.1
Dental Hygiene-Extended Duty		3	8	0	0.0
Dental Laboratory Technology		3	9	0	0.0
Denture Therapy		3	12	0	0.0
Dispensing Optician		2	24	0	0.0
Funeral Services Education		2	44	0	0.0
Health Records Administration		2	12	1	8.3
Health Records Technician		1	14	4	28.6
Health Records Technician		2	11	0	0.0
Hearing Aid Consultant		1	17	5	29.4
Med Lab Technology-Preparatory		1	0	0	N.A.
Medical Laboratory Technology Fr. 3		3	197	41	20.8
Nursing Assistant		1	222	48	21.6
Nursing-Critical Care		3	11	0	0.0
Nursing-Diploma Fr.		2	1,510	234	15.5
Nursing-Neonatal Intensive		3	16	0	0.0
Nursing-Operating Room		3	16	0	0.0
Nursing-Refresher		2	41	9	22.0
Orthotic/Prosthetic Technician		2	9	0	0.0
Pharmacy Assistant		1	72	4	5.6
Physiotherapy		3	22	4	18.2
R.N.-Mental Health		3	6	0	0.0
Radiography		2	80	42	52.5
Respiratory Technician		2	15	2	13.3
Respiratory Technology Fr.		3	10	0	0.0
RNA-Operating Room Techniques		1	15	0	0.0
TOTAL 1-YEAR PROGRAMS		1	748	104	13.9
TOTAL 2-YEAR PROGRAMS		2	1,949	301	15.4
TOTAL 3-YEAR PROGRAMS		3	335	51	15.2
DIVISIONAL TOTAL			3,032	456	15.0

DIVISION: TECHNOLOGY		Duration (Years)	Number Available For Work	No. Still Seeking Work as at 15 Nov. 1979	
PROGRAM NAME					%
Accoustics Technician		2	1	0	0.0
Aerial Survey Technician		2	1	0	0.0
Air & Water Resources		3	21	0	0.0
Air Transport Ground Support		3	7	2	28.6
Aircraft Maint Technician		2	117	0	0.0
Aircraft Maint Tn-Helicopter		2	32	0	0.0
Appliance & Vend Mach Servicing		1	15	1	6.7
Architectural Drafting Techn		2	50	2	4.0
Architectural Technician	Fr.	2	44	7	15.9
Architectural Technology	Fr.	3	116	10	8.6
Audio-Visual Technician		2	65	8	12.3
Auto Parts Technician		1	3	0	0.0
Automotive Technician		2	50	1	2.0
Automotive Technology		3	9	1	11.1
Aviation & Flight Techny		3	13	0	0.0
Aviation Techny & Pilot		2	13	2	15.4
Avionics Maintenance		1	24	1	4.2
Avionics Technician		2	16	2	12.5
Biochemical Technician		2	8	1	12.5
Biochemical Technology		3	25	9	36.0
Biology Lab Technology		3	7	4	57.1
Biomedical Eqpt Tech		2	1	0	0.0
Cartographic Technician	Fr.	2	30	1	3.3
Cartographic Technology		3	8	2	25.0
Chemical Engrg Technician		2	34	7	20.6
Chemical Engrg Technology		3	75	9	12.0
Civil Engineering Technician		2	59	4	6.8
Civil Engrg Techn-Explosives		2	7	0	0.0
Civil Engrg Technology		3	162	11	6.8
Combustion Technician		1	7	0	0.0
Combustion Technician		2	4	0	0.0
Computer Science Technician		2	5	0	0.0
Computer Science Technology		3	72	3	4.2
Computer Systems Design		3	7	1	14.3
Construction Technician		2	71	6	8.5
Construction Technology		3	35	0	0.0
Control Systems Technology		3	26	1	3.8

DIVISION: TECHNOLOGY PROGRAM NAME	Duration (Years)	Number Available For Work	No. Still Seeking Work as at 15 Nov. 1979		%
Drafting-General	2	15	1		6.7
Electric Power Technology	3	3	0		0.0
Electrical Controls Technician	2	8	0		0.0
Electrical Engrg Technician	2	96	4		4.2
Electrical Engrg Technology	3	48	1		2.1
Electromechanical Technology	3	6	1		16.7
Electromechanical Draft Techn	2	9	1		11.1
Electromechanical Engrg Techn	2	4	0		0.0
Electronics Technician	2	228	15		6.6
Electronics Technology Fr.	3	168	1		0.6
Electronics-Domestic	1	16	0		0.0
Engineering Drafting Techn	2	26	1		3.8
Environmental Planning	2	9	0		0.0
Fire Protection & Ind. Safety	2	15	5		33.3
Fire Protection Technology	3	2	0		0.0
Fish & Wildlife Technology	3	8	0		0.0
Fish & Wildlife Technician	2	35	2		5.7
Flight Instructor Training	1	11	0		0.0
Fluid Power Technician	2	21	0		0.0
Fluid Power Technology	3	7	0		0.0
Food Processing Technology	3	19	1		5.3
Forest Recreation Technology	3	10	3		30.0
Forest Technician	2	94	12		12.8
Forest Technology	3	13	1		7.7
Furniture Renovation Techn	2	19	0		0.0
Geological Technician	2	25	1		4.0
Geological Technology	3	21	0		0.0
Heavy Eqpt Constr Techniques	2	20	0		0.0
Heavy Equipment Technician	2	35	3		8.6
Heavy Equipment-Diesel	1	28	3		10.7
Helicopter Pilot	1	14	1		7.1
Historical Restoration Techny	3	1	0		0.0
Industrial Chemistry Techn	2	6	2		33.3
Industrial Chemistry Techny	3	6	0		0.0
Industrial Design	3	18	3		16.7
Industrial Engrg Technician	2	12	0		0.0
Industrial Lab Assistant	1	2	1		50.0

DIVISION: TECHNOLOGY		Duration (Years)	Number Available For Work	No. Still Seeking Work as at 15 Nov. 1979		%
PROGRAM NAME						
Industrial Microbiology		2	2	1	50.0	
Industrial Microbiology		3	12	3	25.0	
Industrial Safety		3	2	0	0.0	
Industrial Technology		3	13	2	15.4	
Instrumentation Technician		2	55	2	3.6	
Instrumentation Technology		3	7	1	14.3	
Instrumentation-Process Control		2	8	1	12.5	
Jewellery Repairs		3	2	0	0.0	
Laboratory Science Technician		2	19	0	0.0	
Laboratory Science Technology		3	17	1	5.9	
Machine Shop		1	18	4	22.2	
Manufacturing Technician		2	2	0	0.0	
Manufacturing Technology		3	8	1	12.5	
Marine Engineering		3	7	0	0.0	
Materials Science		2	7	0	0.0	
Mechanical Drafting Technician		2	16	0	0.0	
Mechanical Engrg Technician Fr.		2	50	2	4.0	
Mechanical Engrg Technology		3	101	3	3.0	
Metallurgical Technology		3	14	0	0.0	
Mining Technician		2	20	0	0.0	
Mining Technology		3	29	2	6.9	
Motive Power Techn-Diesel		2	12	0	0.0	
Museum Technology Fr.		3	7	1	14.3	
Navigation Officer		3	13	0	0.0	
Packaging Design		3	13	2	15.4	
Pharmaceutical Chemistry Techy		3	7	0	0.0	
Piano Technician		2	10	0	0.0	
Piping Drafting		1	5	0	0.0	
Plant Maintenance		1	1	0	0.0	
Plastics		2	8	0	0.0	
Process Operations		1	52	3	5.8	
Production Design Technician		2	4	0	0.0	
Quality Control		1	8	0	0.0	
Recording Engineering		3	7	2	28.6	
Refrig & Air Cond Technician		2	48	1	2.1	
Refrig & Air Cond Technology		3	6	0	0.0	
Refrig & Air Conditioning		1	14	5	35.7	

DIVISION: TECHNOLOGY		Duration (Years)	Number Available For Work	No. Still Seeking Work as at 15 Nov. 1979	%
PROGRAM NAME					
Resource Drilling Technician		2	9	0	0.0
Stationary Engineer 4 & 3		1	21	0	0.0
Structural Technology		3	5	0	0.0
Survey Technician Fr.		2	47	4	8.5
Survey Technology		3	21	1	4.8
Telecommunications Techny		3	8	0	0.0
Textile Technology		3	12	0	0.0
Tool & Die Technician		2	28	1	3.6
Transportation Technology		3	14	0	0.0
Underwater Skills		1	26	1	3.8
Watchmaking		2	3	0	0.0
Watchmaking		3	7	0	0.0
Water Resources Technology		3	12	3	25.0
Welding Fr.		1	24	3	12.5
Welding Technician		2	14	0	0.0
Welding Technology		3	9	0	0.0
Wood Products Technician		2	22	2	9.1
Woodworker		1	1	0	0.0
TOTAL 1-YEAR PROGRAMS		1	290	23	7.9
TOTAL 2-YEAR PROGRAMS		2	1,669	102	6.1
TOTAL 3-YEAR PROGRAMS		3	1,266	86	6.8
DIVISION TOTAL			3,225	211	6.5
DIVISION: ALL					
TOTAL 1-YEAR PROGRAMS		1	2,018	265	13.1
TOTAL 2-YEAR PROGRAMS		2	9,212	989	10.7
TOTAL 3-YEAR PROGRAMS		3	3,310	282	8.5
ENGLISH PROGRAM TOTAL			14,540	1,536	10.6

1 "Fr." denotes program also offered in French.

Addendum

A second footnote was omitted from Appendix B as follows:

"Twenty-six percent of the students still seeking work as of November 15, 1979 had secured part-time work while awaiting full-time employment. The percentage figures do not, therefore, represent true unemployment rates."

